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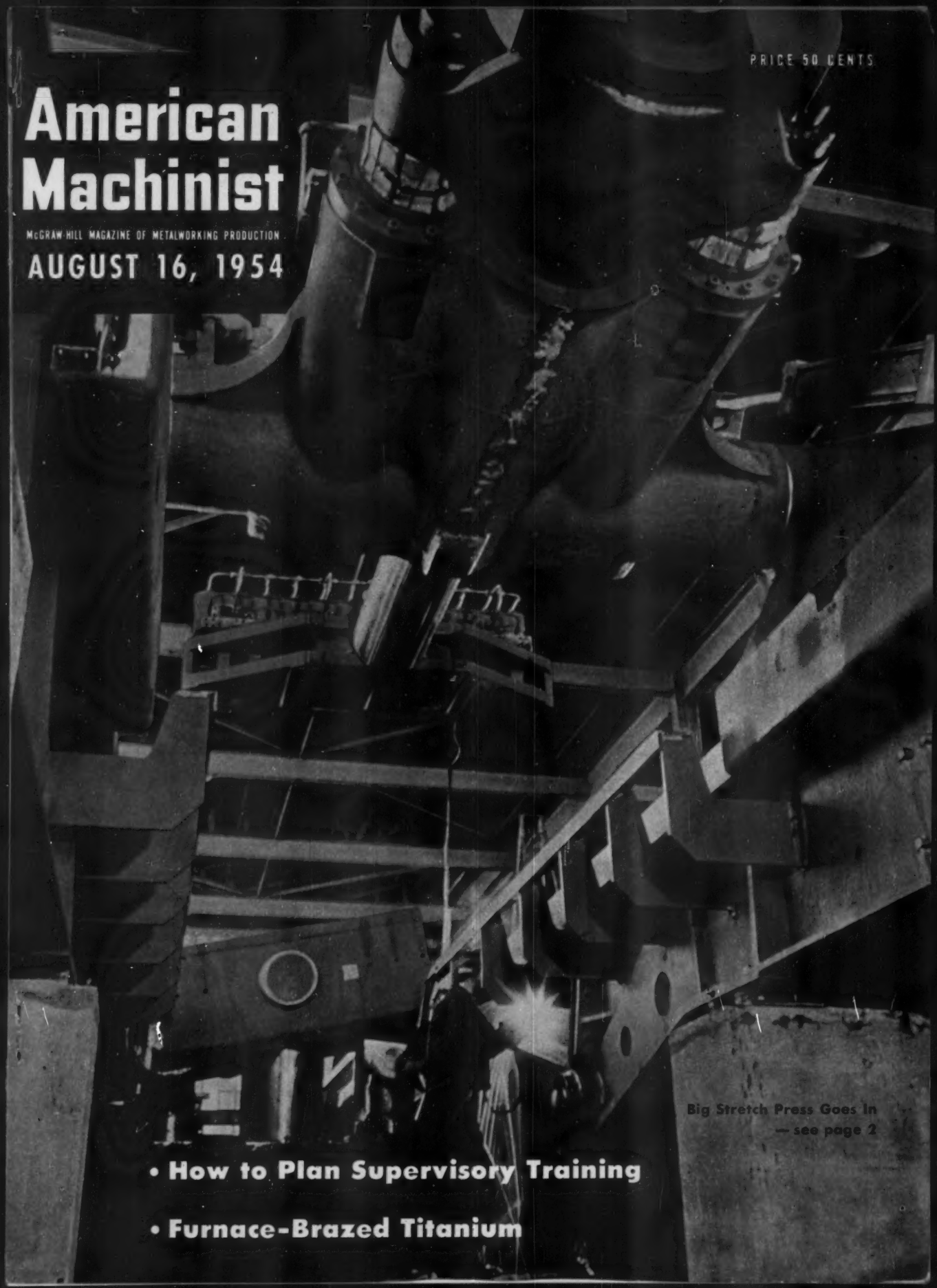
American Machinist

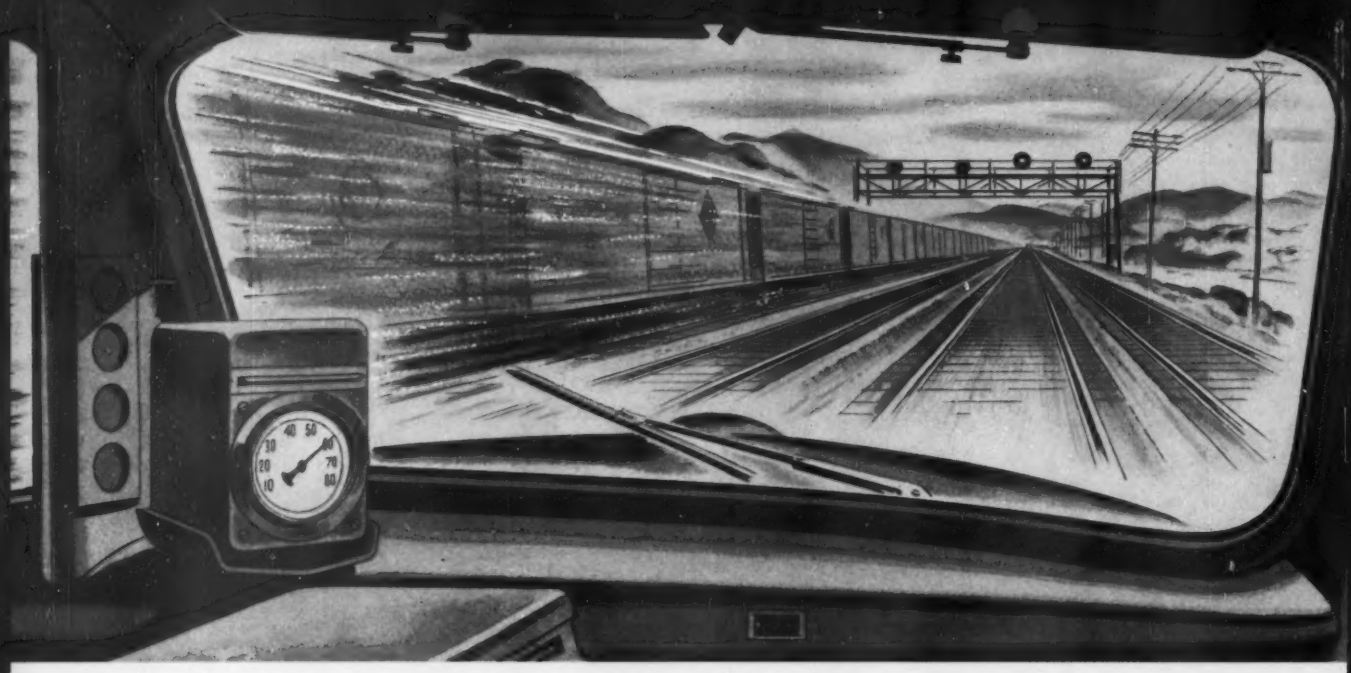
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

AUGUST 16, 1954



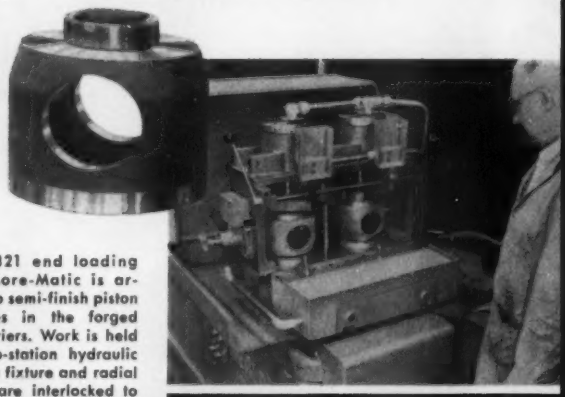
Big Stretch Press Goes In
— see page 2

- How to Plan Supervisory Training
- Furnace-Brazed Titanium



10,000 TONS AT A MILE A MINUTE!

... it will get where it's going a little sooner, a little safer, because this part got the FULL HEALD TREATMENT



You're hitting the high iron at 60 per, with ten thousand tons of fast freight behind you. The huge, smoothly-purring diesels at your command have ample power and stamina to pull this tremendous load for hundreds of miles—with no interruptions, no unscheduled stops.

The tremendous power and long-haul dependability of modern diesel locomotives are a tribute to the skill and ingenuity of their makers. And precision finishing on Heald machines adds much to the stamina and perfect functioning of many vital diesel parts. Here, for example, is a piston pin carrier that is processed on *all three* basic Heald machines—as shown at the right.

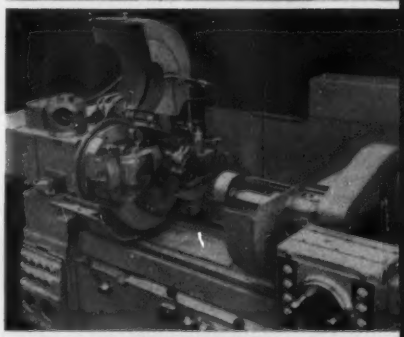
Whenever a part is precision finished on Heald equipment you can be sure of three things. A finer, longer-lasting, precision made part. Important savings in time and production cost. A definite competitive advantage for your product. That's why IT PAYS TO COME TO HEALD.

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

Model 321 end loading Heald Bore-Matic is arranged to semi-finish piston pin holes in the forged steel carriers. Work is held in a two-station hydraulic clamping fixture and radial locaters are interlocked to insure proper location before machine is started.



Model 272 Gage-Matic internal finish grinds the piston carriers. The work is held in an angle plate fixture with hand clamping; location is by pins in locating holes in piston carrier skirt. Workhead spindle positioning units are furnished so that loading will be from one position at all times.

Model 261 Rotary Surface Grinder finishes the shoulder of the piston pin carrier to provide flat smooth surface for locating on the inside dome of the diesel piston. The work is held on a radial pole magnetic chuck with a retainer ring. Machine operates on a standard operating cycle.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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NUMBER OF COPIES PRINTED THIS ISSUE 36,735

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American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index

American Machinist, published bi-weekly by McGraw-Hill Publishing Company, Inc. James H McGraw (1860-1948), Founder.

EXECUTIVE, EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Donald C McGraw, President; Willard Chevalier, Executive Vice President; Joseph A Gerardi, Vice President, Treasurer; John J Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B Smith, Vice President and Editorial Director; Nelson Bond, Vice President, Director of Advertising; J E Blackburn Jr, Vice President, Director of Circulation.

SUBSCRIPTIONS: Address correspondence to American Machinist-Subscription Service, 330 West 42nd Street, New York 36, N.Y. Allow one month for change of address. Subscriptions are solicited only from production executives and engineers in the metalworking industries. Position and company connection must be indicated on subscription orders.

Single copies, 50c. Subscription Rates—United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Other Western Hemisphere and the Philippines, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Reentered as second-class matter, November 17, 1933, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

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ABC ABP

chips

BIG STRETCH . . . Typical of the increased reliance on stretch forming in the aircraft industry is this 250-ton Sheridan longitudinal stretch press at Convair's Plant II in San Diego. The press, which will handle aluminum sheets 6 ft wide and 30 ft long, is one of a number of "elephant" machines going into a new building there. Our cover Kodachrome taken while the press was being installed, shows a welder at work on the frame. The press was pictured in operation in the still unfinished building in *AM*—July 5 '54, p138.

MORE AIRCRAFT . . . AND MORE TI . . . Our cover picture shows aircraft production, as did that for July 5. In that issue, too, we published our plant-to-plant survey of production problems on supersonic planes and the solutions to date. We've also tried to keep you up to the moment on titanium. Our lead story, from Aircraft Components Div, Ferrotherm Co, Cleveland, gives pointers on furnace-brazing titanium, which has been a problem.

SUPERVISORS . . . Actually again based on aircraft experience is our Special Report, written by Associate Editor Stocker from data gathered at Republic Aviation in Farmingdale, LI. It includes complete details of a plan for a supervisory training program, telling how to select trainees, what to teach them, problems, rating students, and the ultimate advantages of the idea.

TOOLING . . . The Argonne National Lab in Chicago deals with weird problems and weird materials. R W Holmes, mechanical engineer, there, describes a combination trepanning and cutoff tool of carbide that does both operations at once in making graphite crucibles. . . . Walter White and Martin McKean at Towmotor Corp, Cleveland, describe how they installed a hard-chrome plating unit for tools, found it especially good for taps and chasers. But the setup has been so extensively used in salvaging expensive parts that tool plating has had to wait. . . . There are also three shots of talented tooling at Remington-Rand, Ilion, NY.

ASSEMBLY . . . Air cylinders solved problems of assembling small parts for refrigerators and clocks at high volume. D E Lisberger of GE's plant at Morrison, Ill, shows some typical setups.

COMING . . . Aug 30 *AM* will provide a case study on ultrasonic machining of carbide dies and glass matrix plates, plus a cover picture showing two new ultrasonic machines in use. There'll also be articles on trepanning Ti, on filtering hydraulic oil, on babbitting, on ending slavery as a subcontractor, and a Special Report on how to understand the cold-working of metals. There'll be another in Stanley Cope's series on draw dies, too, for his increasing host of followers.

MARKET SPECIALIST . . . Arthur H Jones received his EE from Princeton in 1934; then served as an underwriters engineer for the Factory Insurance Association. His metalworking experience includes aircraft manufacture, automobile assembly, machine tools, brass goods, radio and electrical equipment, watchmaking, and firearms manufacture. Mr Jones studied electronics at Harvard and UHF techniques at MIT. Before joining Frank C Brown & Co, Inc as VP, Mr Jones was Director of Field Operations and Product Analysis at Norden Instruments, Inc; before that he was VP of Gray Research and Development Co. His experience includes service as a consultant to the R&D Board, Office of Secretary of Defense, and to the Operations Research Office of Johns Hopkins University. Art is a member of AFCA and IRE. In this issue he discusses freedom from market "slavery."

How to multiply production of straight bevel CONIFLEX® gears and pinions *by as much as 500%*

You can do it with the new No. 104 Straight Bevel CONIFLEX Generator.

The two interlocking disc-type cutters, with 24 blades each, *complete a gear in one rapid operation.*

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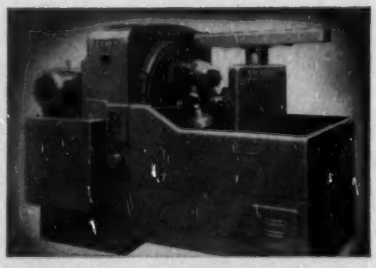
The range of capacity, and the ease of setup, make the No. 104 Straight Bevel CONIFLEX Generator ideal for jobbing.

Calculations have been reduced to a minimum and can be done long hand or with slide rule.



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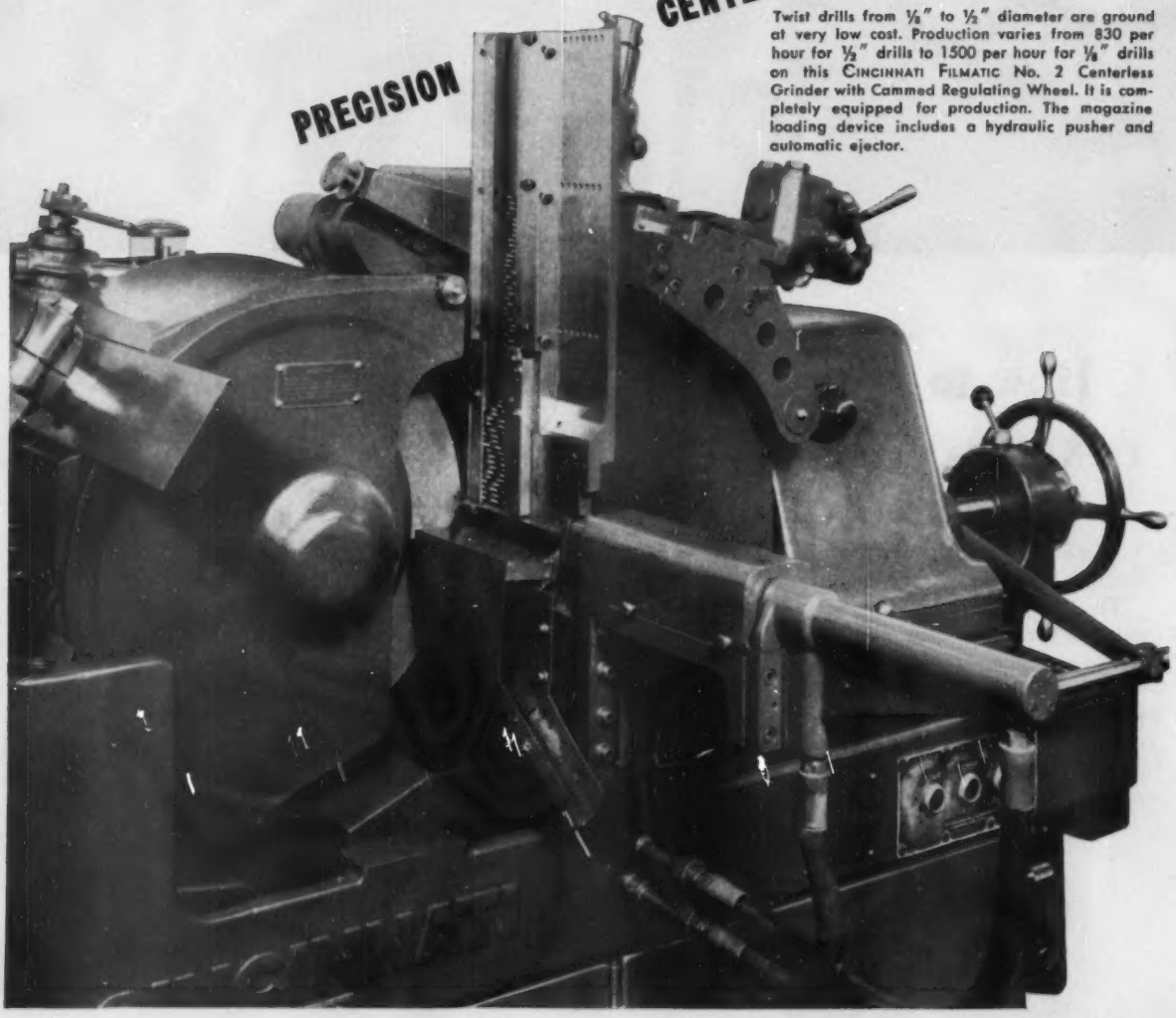


Twist drills from 1/8" to 1/2" diameter are ground at very low cost. Production varies from 830 per hour for 1/2" drills to 1500 per hour for 1/8" drills on this CINCINNATI FILMATIC No. 2 Centerless Grinder with Cammed Regulating Wheel. It is completely equipped for production. The magazine loading device includes a hydraulic pusher and automatic ejector.

Package CINCINNATI

OF TWIST DRILLS

Have you considered automatic centerless grinding for your precision ground parts? The equipment illustrated here, developed by Cincinnati, shows what can be done. A CINCINNATI FILMATIC No. 2 Centerless Grinder is equipped with an automatic magazine loading device and a cammed regulating wheel. This method of precision grinding offers several advantages:

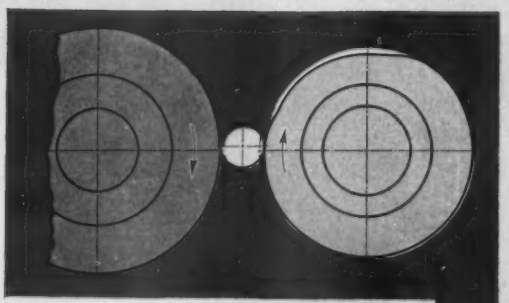
1) High rate of production, with practically no expenditure of manual effort

2) Excellent finish, produced by the last fraction of rotation of the wheel; the "dwell" sector

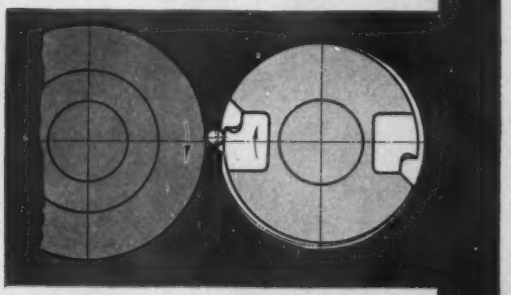
3) Accurate sizing. The "dwell" sector of the wheel removes very little stock; no wheel wear

4) No slide movement; no chance for wear or scoring of ways

5) Regulating wheel trued in position to predetermined cam shape



Cammed regulating wheel. Work is loaded and ejected at low section of wheel. *Production per minute* = rpm of regulating wheel.



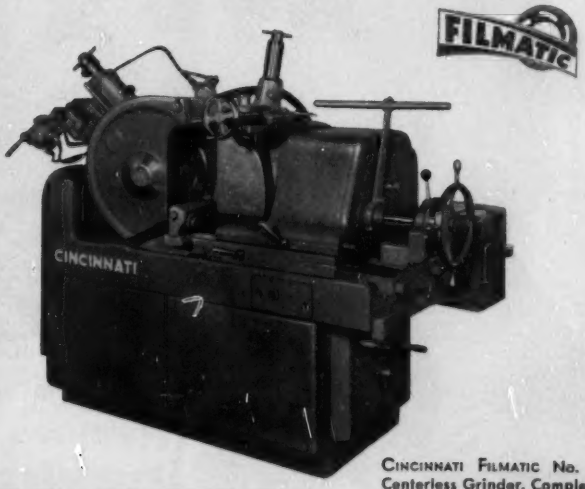
Double cammed regulating wheel, notched for loading and ejecting the work. *Production per minute* = 2 x rpm of regulating wheel.

Methods engineers who are concerned with reducing the cost of grinding operations on parts manufactured in large quantities will find CINCINNATI FILMATIC Cam Infeed Centerless Grinders the answer to their problem. Our Application Engineers will be glad to assist.

CINCINNATI GRINDERS INCORPORATED

Subsidiary of The Cincinnati Milling Machine Co.

CINCINNATI 9, OHIO



CINCINNATI FILMATIC No. 2 Centerless Grinder. Complete specifications may be obtained by writing for catalog No. G-611-1.

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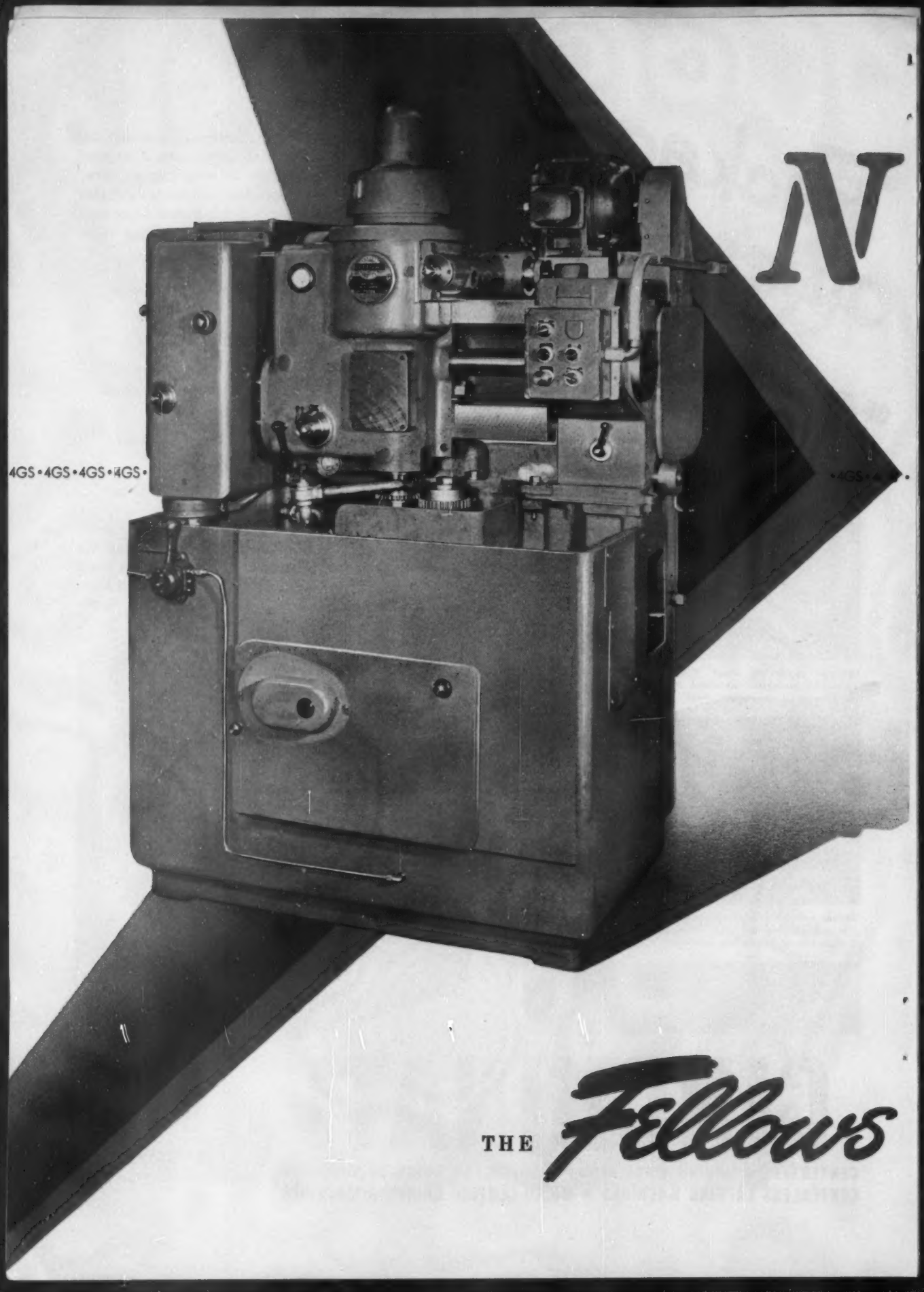
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EWS

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● This, the all-new No. 4GS Gear Shaper, will (1) remove more stock, (2) hold to limits more easily, and (3) turn out finish-cut or preshave gears faster than anything you've known.

● It's a production man's Gear Shaper—with a drive-mechanism beefed up to match its 3⅜ inch diameter cutter spindle which takes 4 inch cutters. Speeds from 98 to 635 strokes per minute are available through pick-off gears.

● Range of rotary feeds from 0.008" to 0.024" per stroke based on a 4 inch pitch diameter cutter.

● Its maximum capacity of 6 inches p.d. x 2 inch face puts it in line for the greatest percentage of mass output gear cutting ... Ask any Fellows office for advance engineering information.

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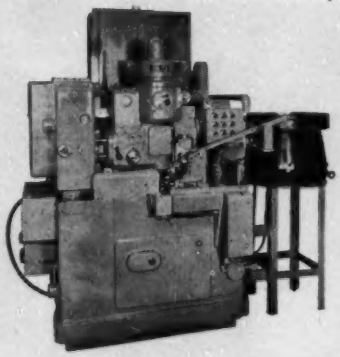

Ideally adapted to automatic loading as illustrated here

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VAN NORMAN Ram Type Millers

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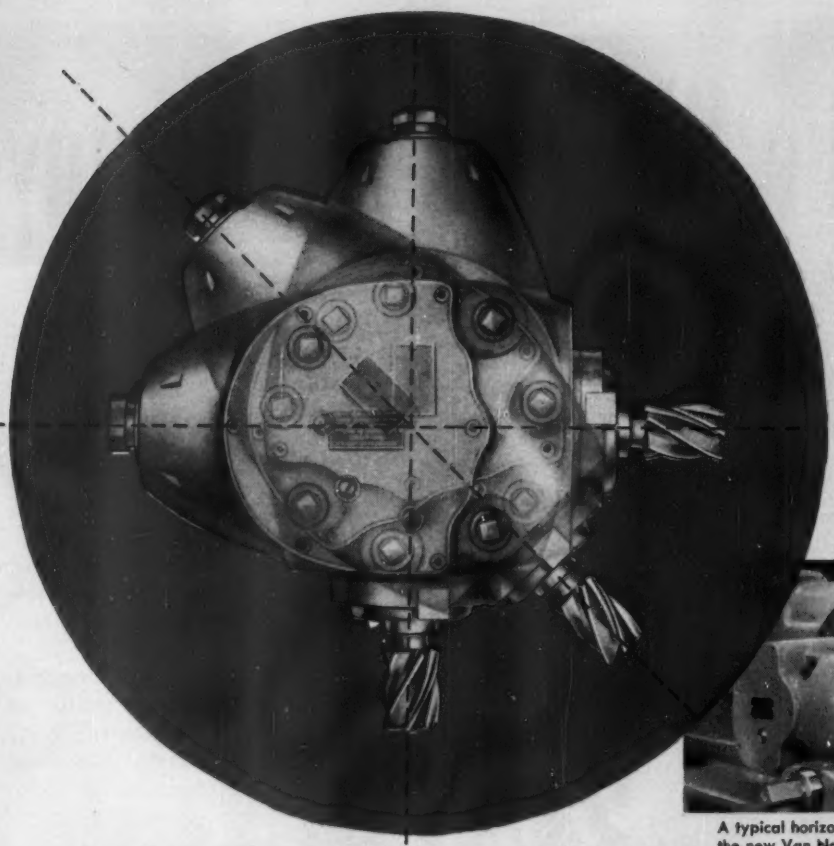
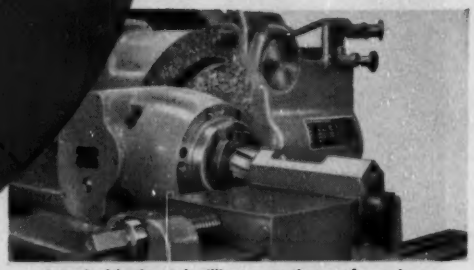
Manufactures Ram and Column Type Milling Machines . . . Cylindrical Grinders . . . Centerless Grinders . . . Spline and Gear Grinders . . . Oscillating Radius Grinders . . . Special Production Grinders





A typical horizontal milling operation performed on the new Van Norman Ram Type Miller.

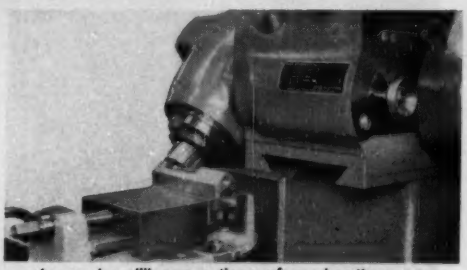
Every one of the *10 new* Van Norman Ram Type Millers give you the operating advantages of extra "*Flex-Ability*" and "*Cut-Ability*" that cut toolroom and production milling costs.

The exclusive adjustable cutterhead, mounted on the heavy-duty movable ram, provides maximum "*Flex-Ability*" . . . enables you to perform horizontal, angular and vertical milling with *one* miller . . . increase the work range that can be handled . . . reduce tooling costs.

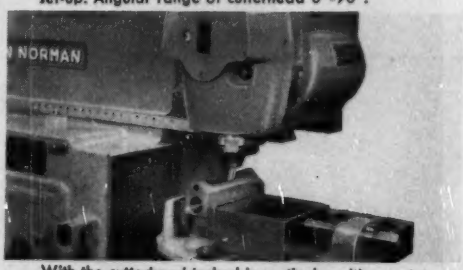
Extra "*Cut-Ability*" is assured through the new heavier columns and bases, larger knee, table and saddle assemblies, extra-heavy gears and spindle motors up to 10 HP.

Production, toolroom, laboratory or job shop . . . you simply can't beat these Van Norman Ram Type Millers for simplified set-ups, tooling and maximum output.

Write, wire or phone for complete details



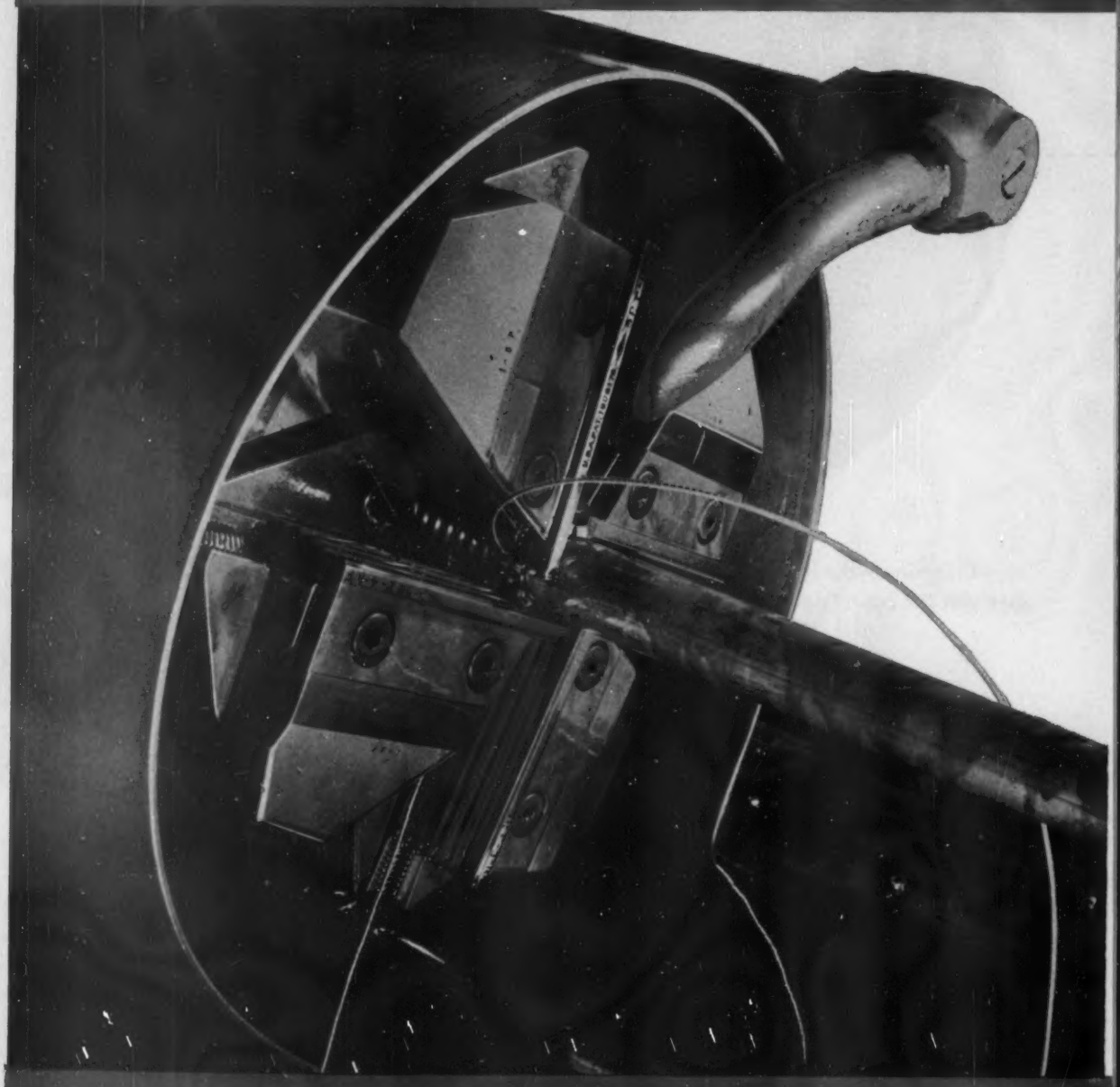
An angular milling operation performed on the same work piece. Note work piece remains in the same set-up. Angular range of cutterhead 0°-90°.



With the cutterhead locked in vertical position a slot is milled in the work piece. Note the set-up has not been changed.

COMPANY | **SPRINGFIELD 7, MASSACHUSETTS**

How The Slaysman Company



LANDIS *Machine* COMPANY

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF

Reduced Threading Time 97%

MR. ALEXANDER S. SMICK, President of the Slaysman Company, large machine shop and parts sub-contractor in Baltimore, said in a field interview: "Our LANDIS machine reduced threading time on this particular job from 2 hours to 4 minutes and made savings on every other job run on it."

The "particular job" referred to by Mr. Smick was a contract involving the cutting of a 1" diameter 5 pitch Acme thread 29" long on C1141 steel to a Class 3 fit. Original production plans were to generate the thread by milling. At the same time, even though the specifications and the hardness of the material seemed to preclude other methods, we were asked if we could suggest a more efficient threading process.

Based on our recommendation after studying the thread specifications, a 1½" LANDMACO Single Head Leadscrew Machine with an extra-long carriage was installed. The LANCO threading head was equipped with centering throat chasers with a roughing and finishing thread form. Centering throat chasers produce threads concentric with the outside diameter, and eliminate the out-of-round condition that often occurs when threading extra-long workpieces. The roughing and finishing thread form chasers cut coarse pitch threads with excellent finish in one pass.

Not only did this method reduce threading time from 2 hours to 4 minutes, but it also produced a very economical 50 pieces between chaser grinds. This is particularly impressive when it is remembered that the thread was 29 inches long and the hardness of the material threaded was near the limits of machineability.

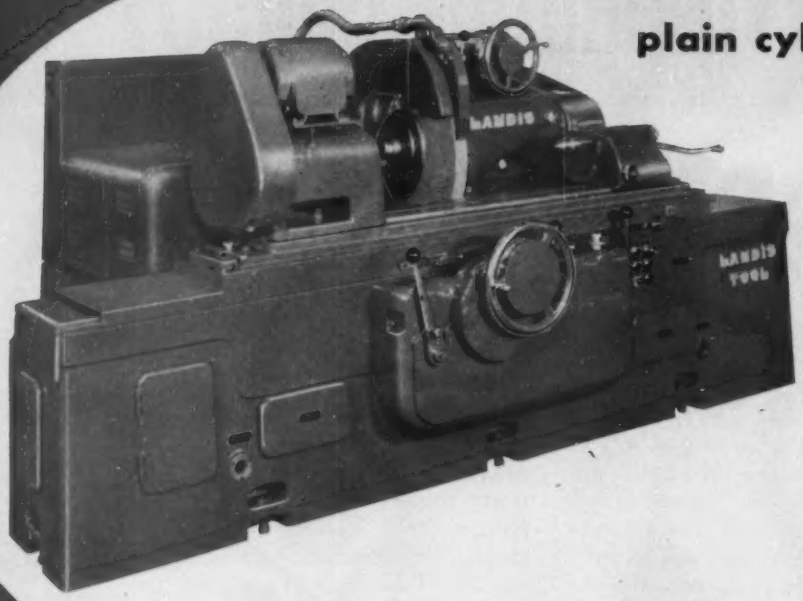
This is not a single outstanding case. While results here were somewhat unusual because of the size of the saving, many other LANDIS machines have made significant savings producing all types of threads. Perhaps we may help YOU make similar economies in your Thread Production.

LANDIS

WAYNESBORO
PENNSYLVANIA

THREAD GENERATING EQUIPMENT

Landis For Any



plain cylindrical grinders

A complete line for economical long or short runs. Swings available from 4" to 24", with lengths between centers from 18" to 240". Special tooling and hydraulic feeds for semi-automatic cycles also available.

centerless grinders

Two sizes made for thru feed or infeed grinding of straight or profiled work. Up to 6" diameter work and 10" wide wheels. A variety of tooling, loaders and feeds available for hand or automatic operation.

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For tool room, job shop or moderate production on a wide variety of cylindrical parts. Does straight, taper, internal and face grinding operations. Available in 10" to 48" swings with lengths from 24" to 120".

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Maximum production of parts like pistons, rolls, crank shafts, cam contours, valves, bearing races and jet engine components. Parts can be chucked or put between centers. Work handling can be built-in.

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precision grinders

You get 45 distinct standard equipment

Here's a highly skilled G&L craftsman making final adjustments in the spindle feed gears. All gears have been flame-hardened and precision ground to insure lasting precision... smooth, vibrationless positive power.

spindle speeds as with a G&L 30 Series

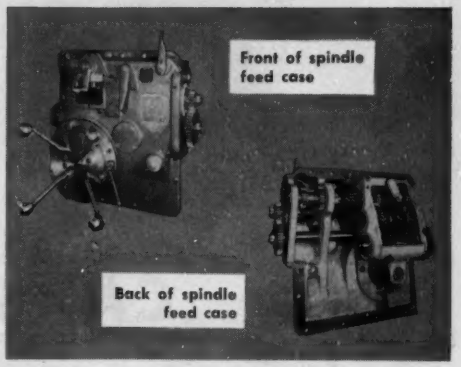
Only a G & L 30 Series table type Horizontal offers so many separate spindle speeds and positive all-geared spindle drive — plus the high torque and full power you need for efficient machining at low or high speeds.

THE engineering of a G&L 30 Series Horizontal Boring, Drilling and Milling Machine's headstock and spindle drive provides a perfectly balanced combination of versatility, efficiency and long-lived precision. With positive all-geared drive — 45 speeds in fine increments — are easy to select or change. Design of the gear train insures high torque at the cutter when working at lower speeds. And — at high speeds — the drive gear shifts and performs with a flywheel effect that provides maximum cutting efficiency of carbide tools. What's more, four gibs on the headstock assure maximum bearing surface, perfect alignment at all times.

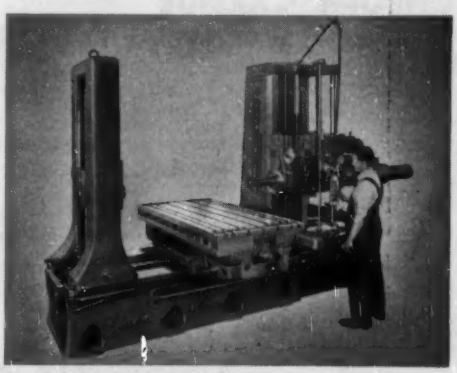
Check these other important advantages

Two of the many other additional advantages you get with a G&L 30 Series are (1) flame hardened and precision-ground bed and saddle ways which are standard equipment and, (2) the option of extended saddle, saddle supports and auxiliary runways which take the risk out of precision machining large workpieces that require the full range of the machine.

Comparing a G&L 30 Series with any other machine in its class — you'll discover that feature for feature, advantage for advantage, you can't buy better. Like all G&L machine tools, the 30 Series has been "often copied, never equaled."



Adjustable micrometer dial graduated in .001" provides fast, accurate spindle positioning. At right, dials beneath cover plate are geared to rotary selectors, show speed or feed engaged. While making selections, operator merely watches window until desired setting appears.



There are two basic models in the 30 Series — the 340-T with 4" spindle and 20 hp, or the 350-T with 5" spindle and 25 hp. Both machines offer a choice of three basic arrangements of table and saddle.

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools — Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools

If WEAR
is a fa[illegible]...

...use

VK CARBIDE PLUG GAGES

TUNGSTEN CARBIDE
wire type .016" to .500" diameter
CHROME CARBIDE
taper insert type .500" to 1.510" diameter

In addition to its regular line of tungsten carbide wire type plug gages from .016" to .500" diameter, The Van Keuren Company now offers a new line of chrome carbide taper insert plug gages in the range from .500" to 1.510" diameter.

Van Keuren tungsten carbide wire type gages have proved their worth on thousands of tough gaging jobs. The new chrome carbide taper inserts (Carboloy, grade #608*) promise to be equally effective. Wearing qualities of chrome carbide are comparable with tungsten carbide. In addition, the material is lighter than tungsten carbide and has a coefficient of expansion close to that of steel . . . both of which factors are a distinct advantage in the larger sizes.

* Trademark of the Carboloy Dept. of General Electric Company.

Finish on Van Keuren gages in either tungsten carbide or chrome carbide will average .5 RMS or better. These gages are available in Class Y, X, and XX accuracies at moderate prices and on a reasonable delivery basis.

Send for a copy of the 220-page Van Keuren Catalog and Handbook No. 35 containing valuable technical and engineering information on measuring problems and methods. Address: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

VK
35th YEAR

THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages

No. 6 in a Series

Carbides dictate the conditions

All accepted cutting tool materials have the common characteristic of specifying the conditions under which they will perform at maximum efficiency. And if the results are sufficiently promising the conditions will eventually be met.

ONE HUNDRED PERCENT carbide application on a multiple spindle bar automatic makes specific demands on both machine and personnel for successful use. The part illustrated is from regular production on comparative runs, in a plant where the conditions were met.

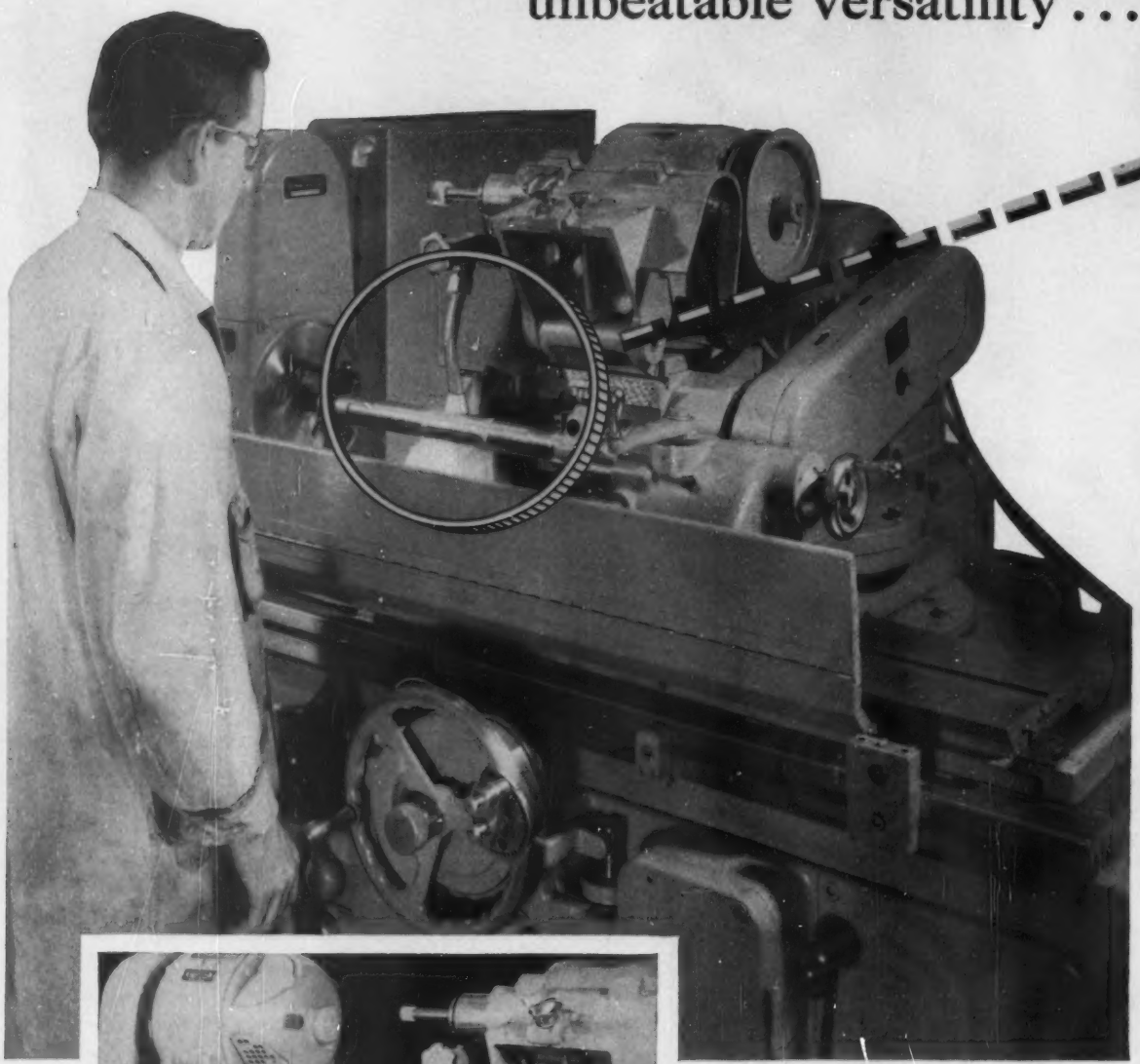
The Conomatic Carbide Development program can be of possible service to you in determining the suitability of your work, or any part of it, to 100% carbide tooling. Just ask your Cone Representative for details, or inquire direct.

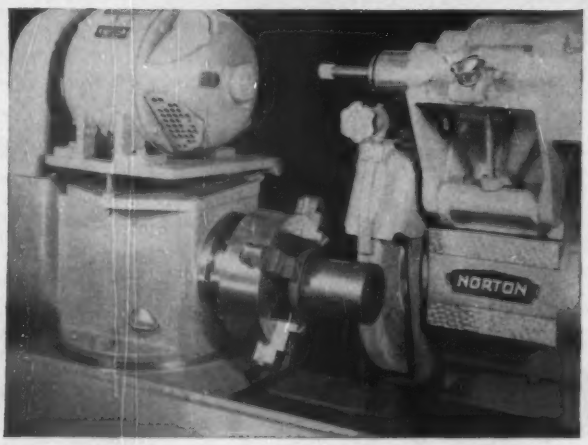
MATERIAL — BRASS: Pickoff attachment in 6th position permits machining piece complete.

	HSS	CARBIDE
Cycle Time	12 secs.	**6 secs.**
Work Spindle Speed	1125 R.P.M. at 331 S.F.	**1528 R.P.M. at 450 S.F.**
Tool Wear	50,000 pcs. per grind	**unlimited number of pieces per grind**

Conomatic} CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

NEW Type U4 Norton Universal Grinders – 12"x36" and 12"x48" – feature unbeatable versatility . . .





Quick, Easy Set-Ups plus fast grinding action enable this new Norton 12" grinder to cut time and costs in a wide variety of external, internal, face and angular wheel feed grinding jobs. Here the internal grinding spindle is shown swung up and out of the way while a shaft is being ground.

Permanent Chuck Mounting is an outstanding advantage. Headstock spindle has a dog drive plate on one end. On the other is a 5" D-1 cam lock nose, on which you can leave a chuck mounted permanently — merely swiveling headstock 180° to start chucking jobs faster.

do more jobs ... save more $$$

Greatly simplified set-ups give you more time for grinding

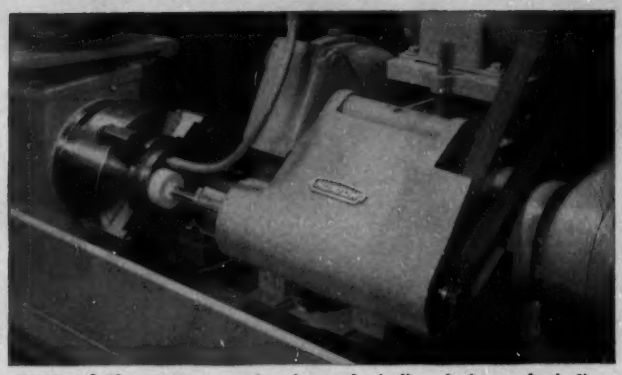
Double-barreled good news! The new Norton universal grinders are made in 12" x 36" and 12" x 48" work capacities!

Versatility keynotes the design, with feature after feature increasing the job range and cutting operating costs. For example, take the work speed range of 40 to 400 r.p.m. You get an infinite number of speeds over this wide range, simply by turning a dial.

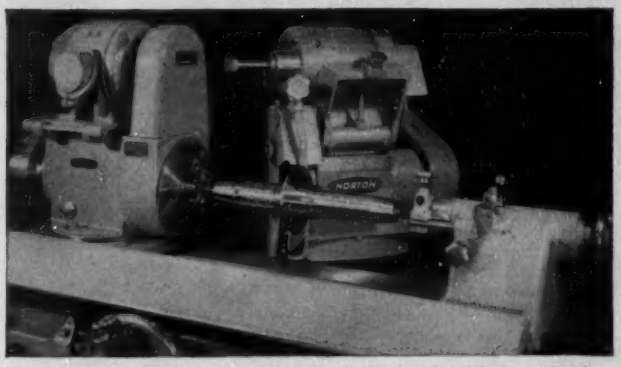
Other important features are illustrated here. It will pay you to look them over carefully — and consider their advantages in your own production.

Get the whole story

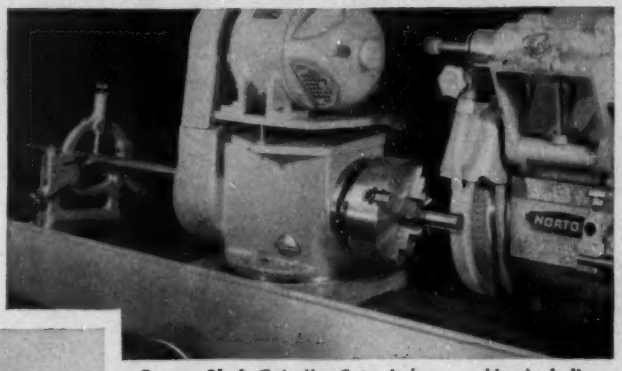
on the broad operational scope and fast, precision performance of these new Norton 12" grinders. See your Norton Representative, or write us direct. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.



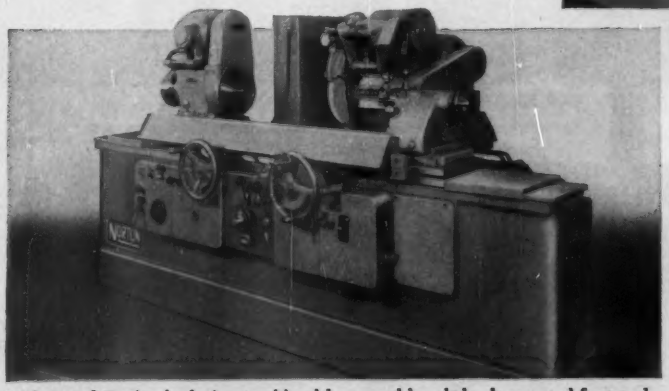
For Quick Change-Over to or from internal grinding, the internal grinding spindle is permanently hinged to front of wheel slide. This also enables you to perform both internal and external grinding on a single workpiece without changing the set-up.



Settings At Any Angle are possible for both wheel and feed, independently, with this compound wheel head slide. Wheel head has swivels above and below the slide ways; upper wheel head member can be positioned to extend capacity when wheel head is swiveled.



Greater Shaft-Grinding Capacity is assured by the hollow spindle in the headstock. A 1¼" hole clear through the headstock spindle permits passage of shafts that may be longer than the machine — another typical advancement that means greater versatility and usefulness.



Advanced Design includes combined lever and handwheel operated footstock, electrical controls grouped in raised cabinet, pumps and motors easily accessible, table-ways pressure-lubricated from outside reservoir, ramped outlet from coolant tank to assist clean-out.

To Economize, Modernize With NEW

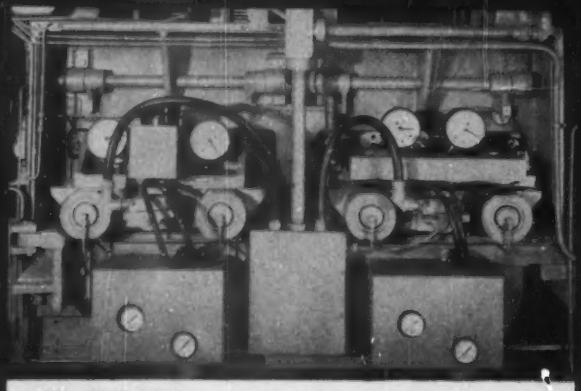
NORTON

GRINDERS and LAPPERS

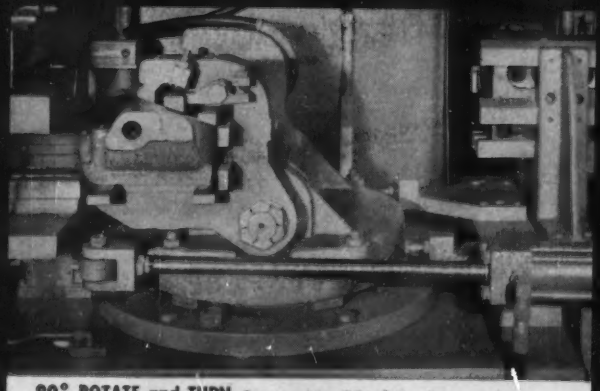
Making better products ... to make other products better

District Sales Offices: Worcester • Hartford • New York
Cleveland • Chicago • Detroit

NEW NATCO HOLEWAY *machines...*



AIR INSPECTION Stations No. 9, 29 and 30 of the first machine check reamed holes for diameter and location.



90° ROTATE and TURN Station No. 32 of the first machine rotates part 90° around each of two axes simultaneously for proper positioning in second machine.

ALL OPERATIONS COMPLETELY AUTOMATIC!

MACHINE No. 1 (35 Station)

1 Loading	1 90° Rotating
14 Working	2 Interference Relief
4 Checking	10 Idle
2 Chip Dumping	1 Unloading

MACHINE No. 2 (25 Station)

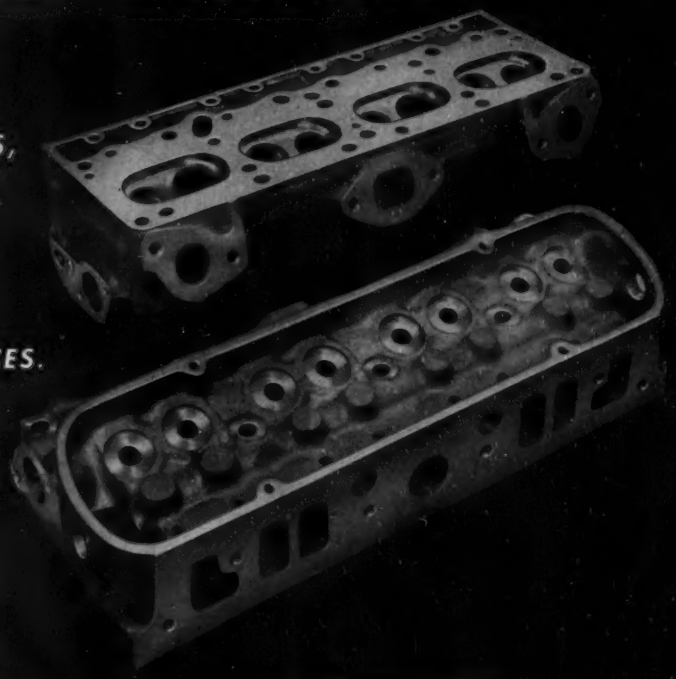
1 Loading	1 90° Rotating
13 Working	3 Idle
3 Checking	1 Ejecting and Replacing
1 Air Testing	1 Unloading

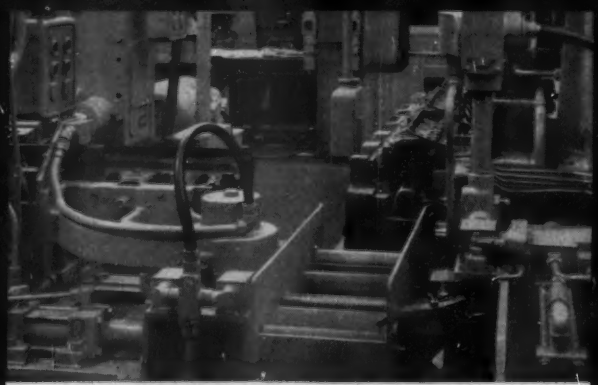
. . . ANOTHER MACHINE

NATCO ENGINEERED for quality and quantity production

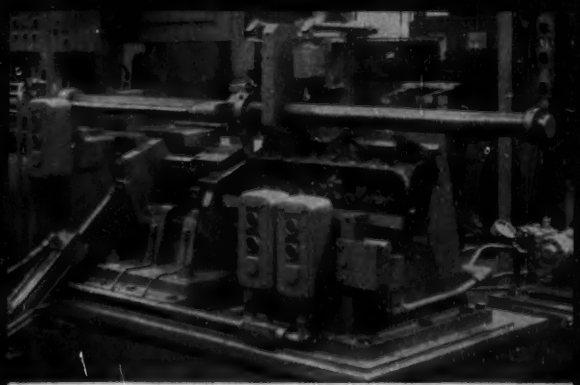
106 CYLINDER HEADS
PER HOUR AT 85% EFFICIENCY!

DRILLS, REAMS, MILLS,
CORE DRILLS, COUNTERBORES,
SPOT FACES and CHAMFERS
ALL SIX SIDES.
REMOVES CHIPS,
INSPECTS HOLE DEPTHS,
SIZES and CENTER DISTANCES.
CHECKS OIL GALLERY
HOLE and EJECTS
DEFECTIVE PART and
REPLACES WITH
SALVAGED PART.





REJECTION and REPLACEMENT Station 17 of second machine air checks oil gallery hole, automatically ejects defective part, station 18 automatically replaces with salvaged part.



70° ROTATION Station No. 24 of the second machine rotates part 70° to bring valve hole in horizontal plane.

Call a Natco Field Engineer

to help you solve your problems in
Drilling, Boring, Facing and Tapping

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

CHICAGO, 2009 Engineering Bldg. • DETROIT, 10138 W. McNichols Rd.
BUFFALO, 1807 Elmwood Ave. • NEW YORK, 35 Beechwood Ave., Mount Vernon

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY

74.9% AVERAGE PRODUCTION INCREASE WITH WARNER & SWASEY ELECTRO-CYCLES!

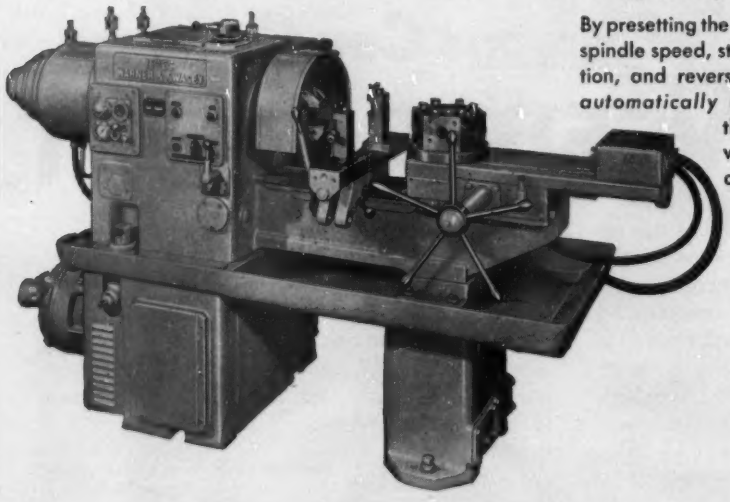
THESE PARTS are typical of the many different jobs machined in one brass shop on Warner & Swasey Electro-Cycle Turret Lathes.

Ranging from 2 to 6 operations, in lots from 100 to 10,000, each part is machined faster—*more profitably*—on the easier operating Electro-Cycles. The chart shows the exact results.

Electro-Cycles have made equally as impressive records in hundreds of other machine shops, turning non-ferrous metals and plastics. A new, improved 2-jaw air-operated indexing chuck now offers you even greater savings. Ask our Field Representative to show you how Electro-Cycles can speed production and build profits for you.

WARNER & SWASEY
16" ELECTRO-CYCLE TURRET LATHE
1½" Bar Capacity—16⅞" Chucking Swing

By presetting the Electro-Cycle "drum control", spindle speed, starts and stops, spindle direction, and reverses for each turret face are *automatically* controlled. Operator zips through precision operations, without tiring himself on time-consuming manual operations.



WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

NEW ATOMIC CANNON

Added Evidence that—

Everyone Can Count on VEEDER-ROOT

This mobile 280 mm. atomic cannon has *two* recoil motions. The primary recoil absorbs the cannon's "kick". The secondary recoil (something new in artillery) absorbs the forces created by the primary recoil. And each recoil motion is recorded by this special Veeder-Root Counter designed with a plunger-action shaft . . . which keeps the score on the cannon's use and indicates approaching need for maintenance.

This again points up the fact that "Anything Worth Making — or Worth Doing — *Is Worth Counting.*" And Veeder-Root has the experience and resources *you* can count on, to give you any counter you need . . . for any mechanical or electrical application . . . in any field from Atomics to Automation. Write:

VEEDER-ROOT INCORPORATED
HARTFORD 2, CONNECTICUT

Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities

"The Name that Counts"

SUSPENSION BEARINGS at

a fraction of their former cost!

Total floor to floor time for Duplicating Lathe operations **52 minutes**

The technique and production time used in this text were taken from actual performance in two of the nation's leading railroad shops.

A complete time study including all pertinent data is available upon request.

This is only one of the Diesel engine component jobs that "American" Hydraulic Duplicating Lathes are performing at record low cost in many of our leading railroad shops. Never has the need for economies in railroad operation been more urgent. Never has there been a better opportunity for effecting economies in the railroad shop than offered by the "American" Hydraulic Duplicating Lathe.

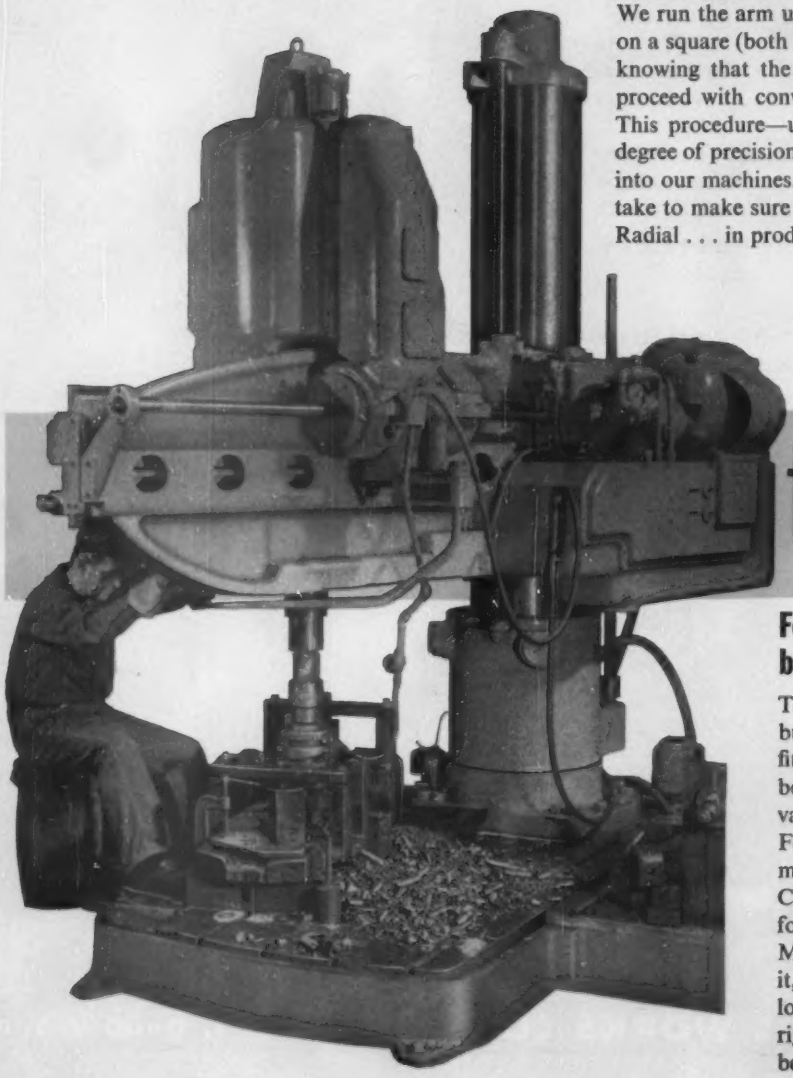
THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Here's another reason it pays to get a proposal from Fosdick

Fosdick aligns the column

Radial alignment at Fosdick starts with the column. We run the arm up and down with an indicator bearing on a square (both lengthwise and across the base). Then, knowing that the column is square with the base, we proceed with conventional tramming and sweep tests. This procedure—used only by Fosdick—adds an *extra* degree of precision to the extra rigidity we have designed into our machines. It's another example of the pains we take to make sure you get the most out of your Fosdick Radial . . . in production, tool life, finish, tolerance.



Fosdick Hydraulic Radials are available with 3′ to 8′ arms, 11″ to 19″ columns. For full information, ask for Bulletin **HRM**.

to give you

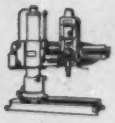
Fosdick takes a "bite" out of boring time at Owen Bucket

Tough cast-steel hinges for clamshell buckets are bored to ± .001″ for a press-fit cast iron bushing—then counter-bored for a washer. For this and a variety of other heavy-duty drilling, Fosdick's proposal on a 5′ 17″ Radial made sense. Now Owen Bucket Co. of Cleveland gets 10 pieces in the time formerly needed to produce 7. As Frank Matisak, General Superintendent puts it, " . . . now we can do more pieces with longer tool life—this machine is more rigid, giving us closer tolerances and better finish."

First

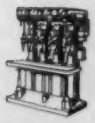
precision production like this

Need Drilling Equipment? Get a Proposal from Fosdick!

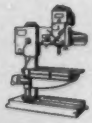


Radial Drills

Jig Borers



Sensitive and Upright Drills

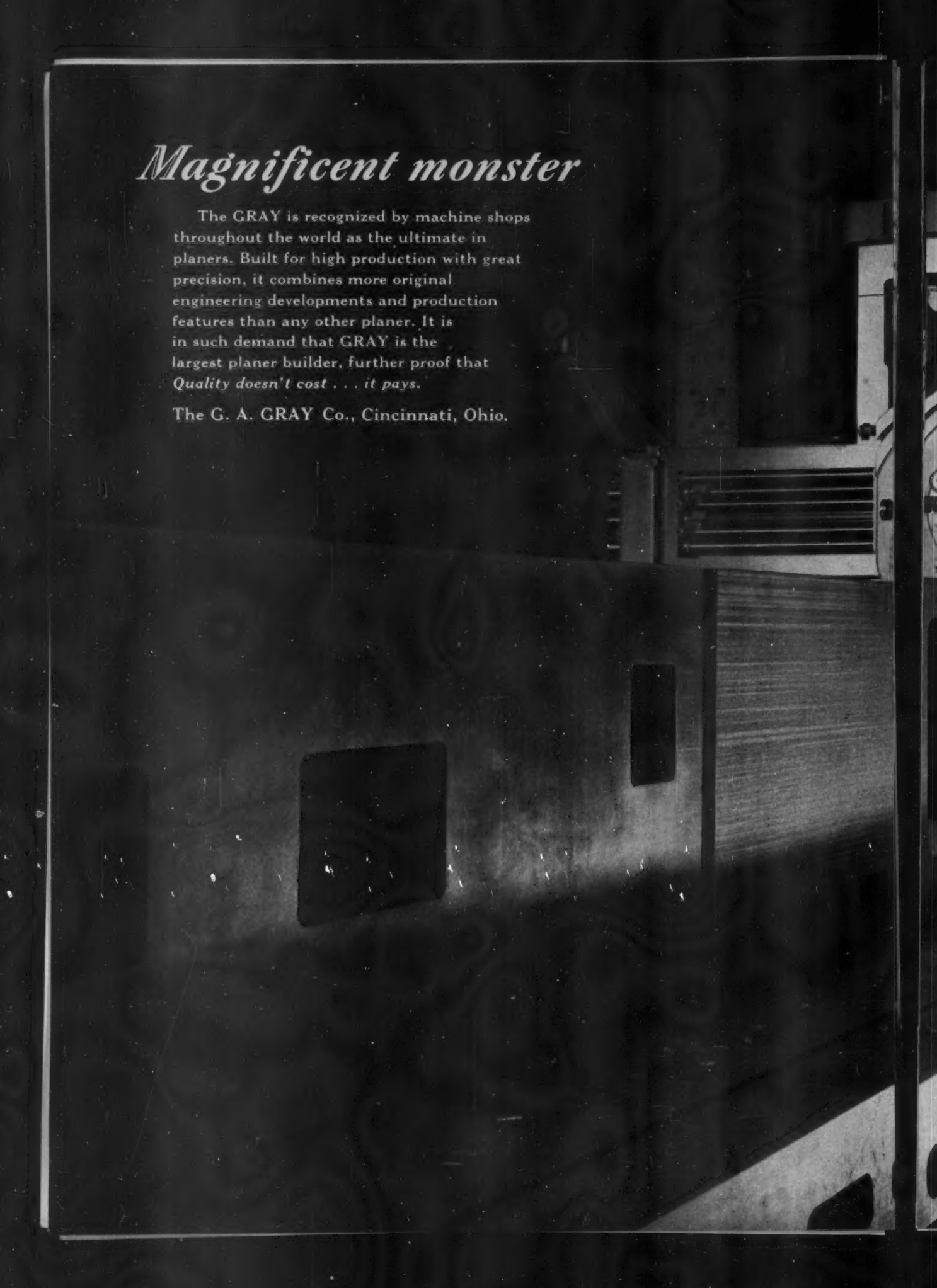


Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO



Magnificent monster

The GRAY is recognized by machine shops throughout the world as the ultimate in planers. Built for high production with great precision, it combines more original engineering developments and production features than any other planer. It is in such demand that GRAY is the largest planer builder, further proof that *Quality doesn't cost . . . it pays.*

The G. A. GRAY Co., Cincinnati, Ohio.

GRAY

smooth, direct parts flow

for short or long runs

Because of its superior ability to take off center die loads, the Henry & Wright Dieing Machine widens the ways in which you can use the economies of progressive stamping. Add to this basic advantage the accessibility of the H & W Dieing Machine for quick die changes.

Now tie the two together and you have a high speed, low cost production method that affords the maximum degree of flexibility in tooling. Jobs can be completed according to the toughest schedules. Short runs can be mixed with long runs. Assembly tooling can be readily incorporated. Your planning becomes a direct and simple matter of figuring so many completed parts per minute or hour per machine.

Most important, too: you cut your stamping costs below your best expectations and you improve parts quality.

Get the facts about H & W Dieing Machines by writing to Henry & Wright, 481 Windsor Street, Hartford, Conn., for Catalog 54.

HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.

HARTFORD, CONNECTICUT

NEW! Norton Cast ALUNDUM* Tumbling Abrasive

Cuts faster and lasts longer... saves you time and trouble... adds the profit-boosting "TOUCH of GOLD"

Cast ALUNDUM abrasive, a typical Norton development for better finishing, is produced in these blocky shapes. It is sharp, dense, hard and non-fracturing.

Cast ALUNDUM tumbling abrasive, newest Norton electric furnace product, is now available to help you cut the time and costs of finishing many of your parts.

Expertly engineered to strengthen the qualities most important to efficient tumbling, cast ALUNDUM abrasive is characterized by:

- *Extreme Sharpness,* which increases cutting speed, reduces tumbling time and expense.
- *Great Density,* which means slower breakdown, longer service life and more work done.
- *Extra Hardness,* which means no fracturing. This eliminates the costly, time-consuming chore of cleaning out chips or slivers that have lodged in the parts being tumbled.

Thorough field testing has proved that these *engineered* advantages of cast ALUNDUM abrasive produce about 10% faster cutting speed and 40% slower breakdown than older types of tumbling abrasive. Why not add these profit-increasing "Touch of Gold" benefits to your own finishing operations?

See Your Norton Distributor
for further facts on cast ALUNDUM tumbling abrasive, now ready for prompt delivery in sizes OOT (1½-2″), OT (1-1½″) and IT (¾-1″). Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

Making better products... to make other products better

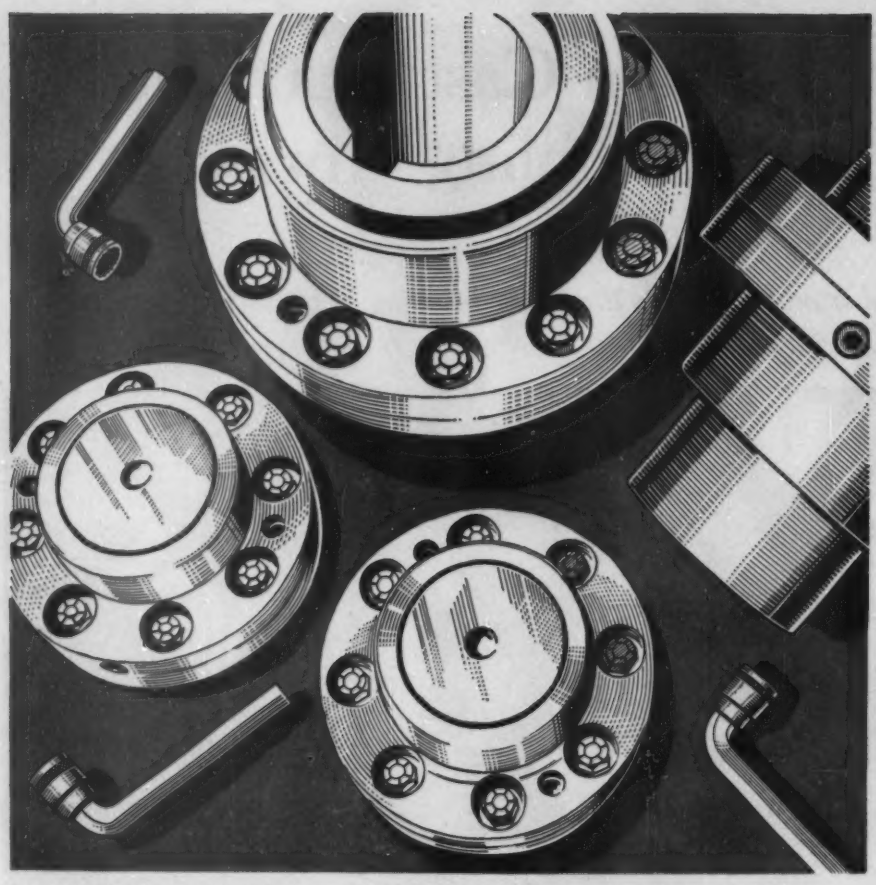
G-278

NORTON

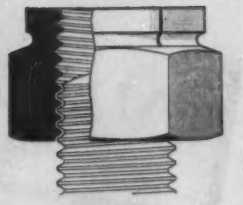
and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

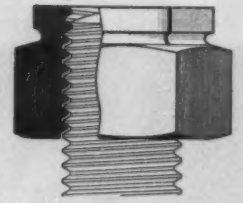
*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries



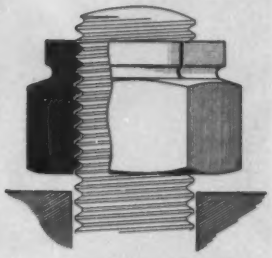
Manufacturers of couplings like these find that FLEXLOC Self-Locking Nuts provide faster assembly and safer, more dependable locking than is afforded by most other methods.



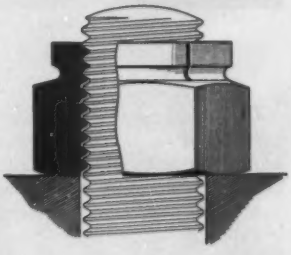
Starting. A FLEXLOC starts like any ordinary nut. Put it on with your fingers. Tighten it with a standard hand or speed wrench.



Beginning to Lock. As the bolt enters the segmented locking section, the section is expanded, and the nut starts to lock.



Fully Locked As a Stop Nut. When 1½ threads of a standard bolt are past the top of the nut, the FLEXLOC is fully locked. A FLEXLOC does not have to seat to lock.



Fully Locked As a Seated Nut. When it is used as a lock or stop nut, the locking threads of the FLEXLOC press inward against the bolt, lifting the nut upward and causing the remaining threads to bear against the lower surface of the bolt threads. Vibration will not loosen a FLEXLOC, yet there is no galling of threads.

Here's why more and more original equipment manufacturers specify FLEXLOCs

Whether it's on power transmission couplings or on access doors of helicopters, more and more FLEXLOC Self-Locking Nuts are being used to insure positive fastening of assemblies.

There are many reasons for this. FLEXLOCs reduce production costs. They are easy to install. They are one piece, all metal—nothing to assemble, come apart, lose or forget. They eliminate complicated, time-consuming methods of locking bolts and studs. They stay put—once their locking threads are fully engaged, they won't work loose. They are easy to get—SPS can make prompt delivery of FLEXLOCs in any quantity, and in a wide range of sizes, through a national organization of industrial distributors. Write for literature and samples. STANDARD PRESSED STEEL Co., Jenkintown 1, Pa.

FLEXLOC® LOCKNUT DIVISION

SPS
JENKINTOWN PENNSYLVANIA

Production Pointers from GISHOLT

GISHOLT TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help you cut time and costs in your own work.

FINISHING LARGE AND SMALL DIAMETERS AT THE SAME TIME

Speeder-Operated Boring Bar Does the Trick

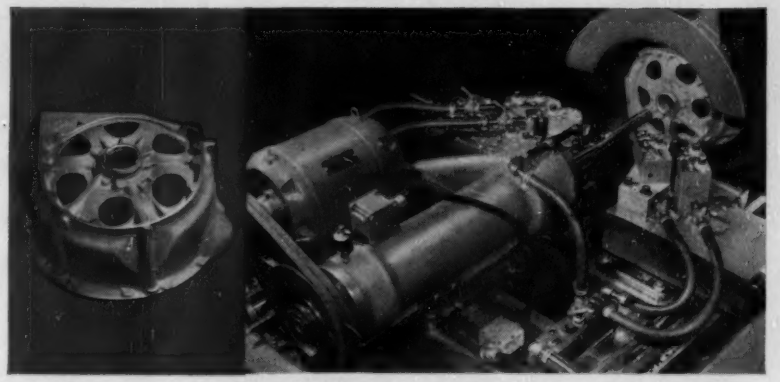
How to achieve both high speed and fine finish on these die-cast aluminum torque converter housings? Here's a nice example of production planning that does it!

This fast, two-operation job is done on a pair of Simplimatic Automatic Lathes. For the first side, the workpiece is clamped on the large flange face by means of an air-operated drawback fixture with location and drive from dowel holes in the flange. Tools mounted on the front and rear slides rough and finish face.

While the front and rear slides are working, tools on a special speeder-equipped, piloted boring bar mounted on the center slide bore and chamfer. Spindle speed is 500 r.p.m., and with the speeder operating, boring speed is increased to 800 r.p.m.—just the right combination of speeds for uniform finish on the machined surfaces. Time for this operation is under 1 minute f.t.f.

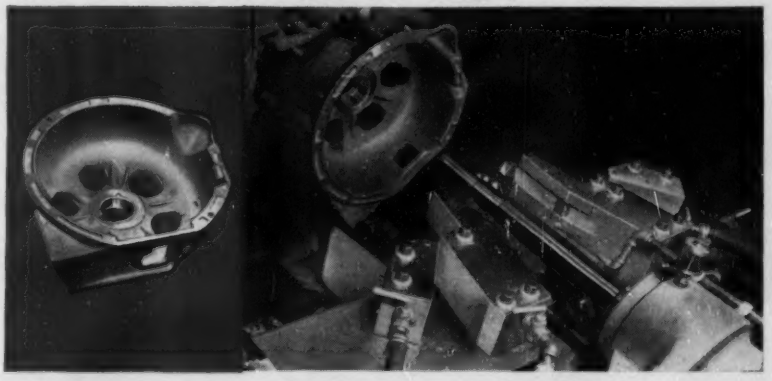
Same Operator Runs 2nd Machine

For the final operation, a special air-operated drawback fixture is also used, locating and driving from dowel holes in the large flange. Part is held against large flange face by clamping through three cored holes. There is a vibration dampener between the fixture and large flange face for quieter operation and prevention of possible chatter.



First Machine with special speeder-operated boring bar.

Second Machine also has special boring bar speeder arrangement.



Once again tools on the front and rear slides rough and finish face while tools on the special, speeder-equipped, piloted boring bar counterbore and chamfer. Again, time is less than 1 minute, f.t.f. One operator can easily handle both machines with hourly production totaling 48 completed housings at 80% efficiency.

Rotating the boring bar as well as the work provides correct speeds for machining all surfaces while saving time and achieving fine finish.

There's a great deal of interesting information in the pages of the Simplimatic catalog; also many helpful job reports. Write for your copy.

TIME-SAVING IDEAS

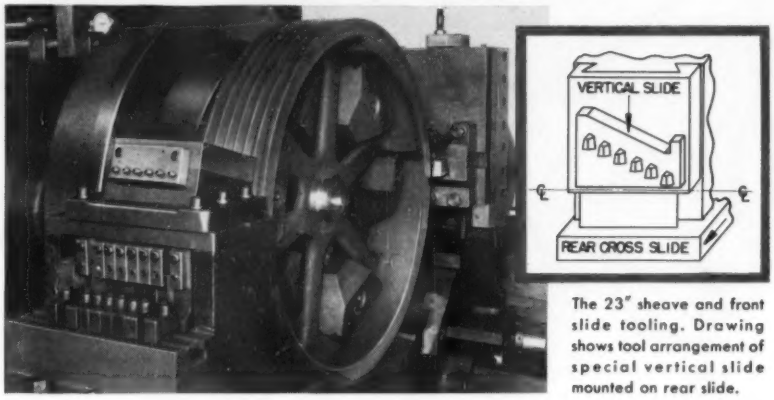
GOOD TIPS ON MACHINING SHEAVES

Novel Tooling on Fastermatic *Automatic* Turret Lathe

Everybody's looking for new ways to get speed and quality at lower cost! Aren't you? Here's a fine example of how you can do it in machining large sheaves.

The 23" diameter parts are handled on a Fastermatic Automatic Turret Lathe. All work on the hub is performed with standard tools on the hexagon turret—drilling, boring, reaming, facing and turning. Tools on a special back-facing attachment, operated through the spindle, face and turn the opposite end.

Of special interest is the unique method of machining the six grooves. First, tools on a special tool block mounted on the front slide rough out the grooves and chamfer the edges. Then, via a smart skiving operation, the grooves are finish-formed. This is done by six tools carried in a special vertical slide mounted on the rear slide. After the rear slide feeds in to a dead stop and holds up, the vertical slide feeds downward. Each tool is mounted slightly higher than the tool preceding it. One tool at a time cuts its groove as it feeds past the center line—assuring fine, smooth finishes with no distortion trouble.



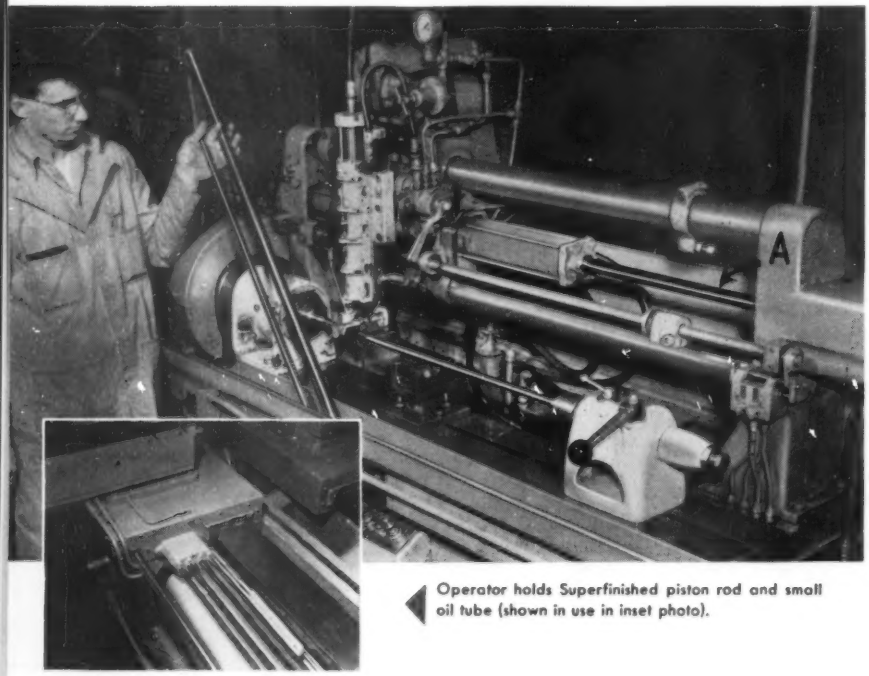
The 23" sheave and front slide tooling. Drawing shows tool arrangement of special vertical slide mounted on rear slide.

This novel single-tool method of finish-forming the grooves eliminates distortion to assure better finish. Automatic production cuts costs.

* * *

PUTTING AN END TO OIL SEAL PROBLEMS

Low-Cost Superfinish Means Better Operation—Less Maintenance



Operator holds Superfinished piston rod and small oil tube (shown in use in inset photo).

In more and more cases, Superfinishing is becoming a part of original specifications. Here it was specified to prevent oil seal troubles and provide more satisfactory and lasting service.

The smaller tube held by the operator is a telescoping connection carrying high-pressure oil to carriages and slides on Gisholt No. 24 Hydraulic Automatic Lathes. For a positive oil seal, the full length is Superfinished to 2½ to 3½ micro-inches from a ground surface of 20 to 30 micro-inches. The same is true of the large rod which is a hydraulic cylinder piston rod similar to "A" on this Superfinishing machine.

Superfinish removes all smear metal left from previous grinding operations. It also eliminates chatter marks and grinding flats which normally cause excessive packing wear and frequent servicing.

Low micro-inch surface readings are quickly obtained at little cost with this Superfinisher which does the job in a fast, automatic cycle.

GISHOLT

TIME-SAVING IDEAS

THEY WASTE NO TIME HERE...IN PRODUCTION OR CHANGEOVER

117 Parts per Hour with No. 12 Hydraulic Automatic Lathe

A simple enough machining job, this one. But it shows what can be gained by careful start-to-finish planning.

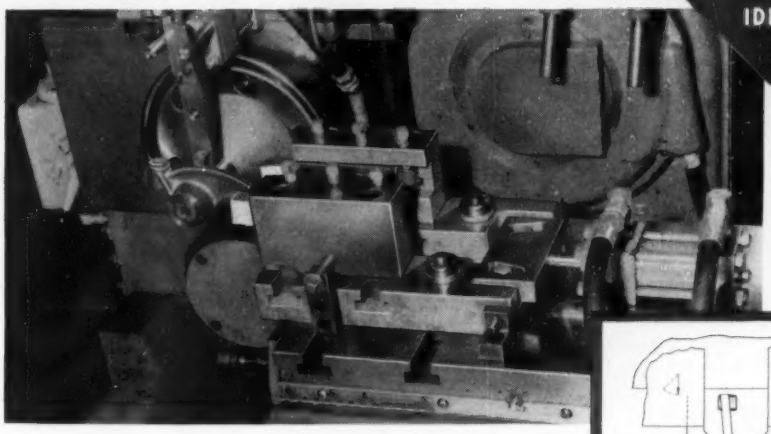
The problem is twofold—speedy straddle facing for these parts, and at the same time—fast, easy changeover for 13 different sizes.

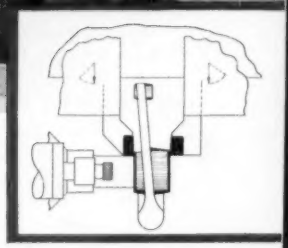
The machine is a Gisholt No. 12 Hydraulic Automatic Lathe—a machine you can't beat for work of this kind. In this case, all work is done from the rear slide, leaving the front of the machine clear for extra-fast loading and unloading.

The workpiece is slipped on an air-operated expanding mandrel, locating from the face of the rocker web against an adjustable jack at the base of the air-operated retractable locator.

To start the cycle, the operator raises a single lever which chucks the part on the mandrel and retracts the locator which in turn actuates a limit switch starting the machine. The rear independent slide feeds forward with tools straddle-facing both hubs. There is tool relief at the end of the cut. Fast starts and stops are provided by the electric clutch and brake. Production is at a rate of 117 parts hourly at 80% efficiency.

As for swift, simple changeover, here's all there is to it: an easy sideward adjustment of tool blocks is made in T-slotted bases; the locator jack is altered and the mandrel is changed for size.





Below, typical parts handled by No. 12 Hydraulic Automatic Lathe.

Note that tool blocks pivot at end of cut, providing tool relief.

Nearly 2 parts a minute are produced here because of fast loading, starting and machining provided by the No. 12 Automatic Lathe.

Twenty-eight interesting examples of quality production of both simple and complex parts are pictured in the complete new No. 12 catalog. Write for it.

★ ★ ★

CAN THIS KIND OF BALANCING HELP YOU?

Workpiece is handled in overhanging position

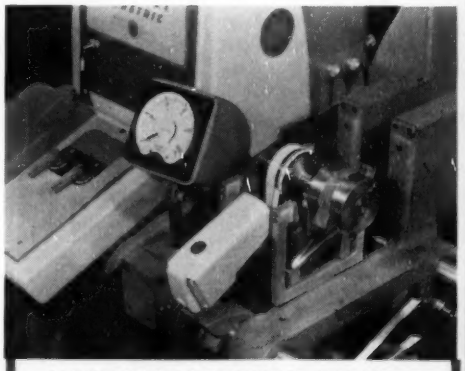
High-speed shaper heads used in woodworking must be accurately balanced. This eliminates vibration during operation, preventing "ripple" or "chatter" marks from marring molding surfaces.

This manufacturer of woodworking equipment solved his problem by dynamically balancing all shaper heads. To simplify and speed up the balancing operation, the Gisholt Improved Type S Balancer is used. With this machine, the workpiece can be balanced in an *overhanging* position—to make loading easier and faster. Correction is made by drilling radially to the indicated depth in the left and right correction planes.

Production balancing to fine tolerances is "everyday work" for Gisholt Balancers. Both large and extremely small amounts of unbalance can be accurately measured and located because amplification is infinitely variable. Bearing movements as little as .000025" are accurately indicated on the standard machine.

Two-plane balancing of these high-speed parts is made faster, easier by use of overhanging arbor.

DYNETRIC BALANCERS — GISHOLT — DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION



MODERN PRODUCTION BALANCING is one of many important subjects taught in the Gisholt Balancing School. Write for details.

GISHOLT

RAM TYPE TURRET LATHE DOES KING-SIZE WORK

TIME-SAVING IDEAS

Gisholt No. 5 Has Extra-Large Spindle Bore for Light Bar Stock, Tubing, Plastics

It isn't often that ram type jobs call for a 4½" spindle bore. When sizes do get in this neighborhood, you may be able to cut costs even before the job is started. How? By proper selection of the machine.

This job illustrates the point. The large fuse liner nuts (and similar parts) are made from 4½" diameter seamless steel tubing. A Gisholt No. 5 Ram Type Turret Lathe was selected because it was available as a standard machine with a 4½" capacity spindle bore.

Machining the fuse liner nuts consists of facing, rough and finish boring and turning, chamfering, threading the I. D. and cutting off. Floor to floor time is 2.3 minutes.

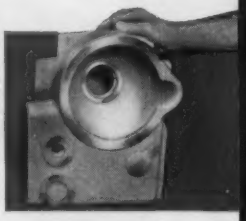
The customer is really taking advantage of the faster, easier operation of this ram type machine. It has a hydraulic collet chuck and bar feed and a turret threading attachment. Even so, the cost is considerably below that of the larger type machine which usually handles this size work.

Setup for fast machining of large-diameter parts. Drawing shows surfaces handled this single operation.

The first and most important step in cost saving here was in selecting the right machine for the job...the standard No. 5 Ram Type Turret Lathe with 4½" spindle bore. From then on low costs were easy.

★ ★ ★

REPETITIVE ACCURACY MADE CERTAIN THIS WAY



Machining housing on 3L Saddle Type Turret Lathe. Inset drawing shows machined surfaces.

Dial Indicator on Saddle Type Turret Lathe Gives Visual Check

What's the best way to maintain close tolerances in machining these awkward cast iron housings? This struck us as a pretty good answer.

Using a Gisholt 3L Saddle Type Turret Lathe, the large irregular-shaped workpiece is held in a 4-jaw independent chuck. Three diameters —*C*, *E* and *G*—are step bored and *D* is chamfered by tools mounted on piloted boring bars. The distance between face *A* and the base of counterbore *F* is closely maintained, and a visual check of machine accuracy is provided by the dial indicator mounted on the finish boring bar. Line boring assures concentricity and permits holding close tolerances, part after part.

While boring takes place, tools on the square turret are used to face the front plate surface *A*, three bosses, *AA*, and chamfer *B*. Simultaneous use of tools on the hexagon turret and square turret shows there's time being saved... an easy matter with the full-swing side carriage and cross-slide features of the Gisholt Saddle Type Lathe.

Good chucking, good tooling with special attention to accuracy aided by a dial indicator assures a good rate of production with uniformity.

No. 7-854

627

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

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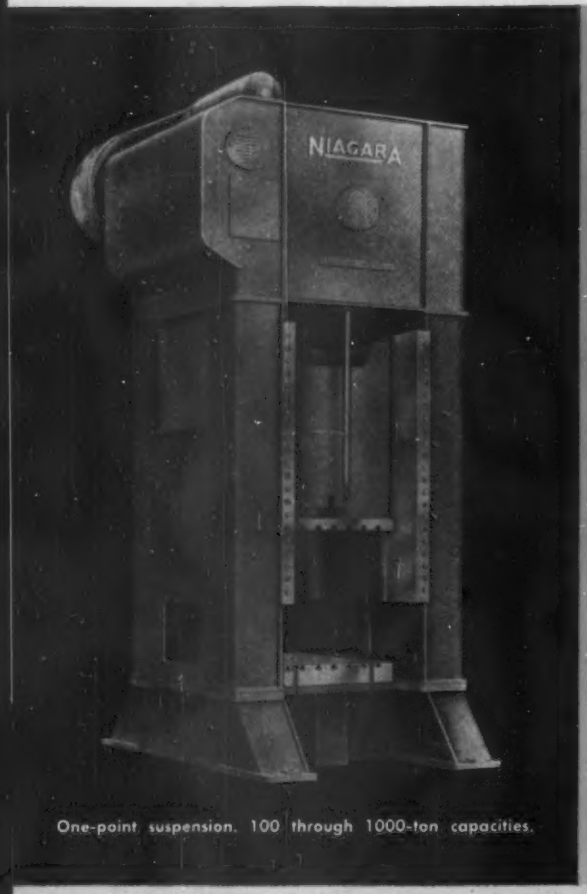

One-point suspension. 100 through 1000-ton capacities.

Four-point suspension. 200 through 1000-ton capacities.

ECCENTRIC DRIVE DELIVERS GREATER TORQUE WITH LESS DEFLECTION

In Niagara Series SE Presses, the eccentric is an integral part of the main gear (or gears) which rotates on a stationary pin rigidly supported in the crown, close to the point at which the pressure is exerted. Serving merely as a pivot, the pin carries no torsional load and relatively little bending load. Net result: Niagara's eccentric gear design can deliver greater torque with less deflection than other types of construction.

RUGGED, RIGID, ALL-STEEL FRAMES PROVIDE GREATER ACCURACY, LONGER DIE LIFE

Frames are rugged, all-steel, four-piece, tie-rod construction of great strength and rigidity, stress relieved in a furnace and thoroughly grit-blasted before machining. Each frame size has been scientifically tested for deflection to meet Niagara standards — the most exacting in the industry.

LOW INERTIA, PNEUMATIC FRICTION CLUTCH RUNS COOLER, WEARS LONGER

Most of the weight of the Niagara clutch continues to rotate with the flywheel. Only the drive shaft and driving plate start and stop with each cycle. The resulting low weight and inertia of the parts, picked up during clutch engagement, greatly reduce heat and wear. As the clutch rotates, it acts as a centrifugal blower, providing positive ventilation. Plates automatically compensate for normal wear, with no adjustment necessary.

MODERN, STREAMLINED DESIGN EMPHASIZES COMPACTNESS

The entire driving assembly is neatly housed in the crown. There is no exposed, overhanging flywheel, clutch, brake, shaft nor motor in the rear of the press to obstruct crane service, block light, throw grease or consume space unnecessarily.

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drawing, punching and blanking work

Two-point suspension. 200 through 1000-ton capacities.

Without equal in engineering design, performance and stamina, this great new line of Niagara Straight Side Eccentric Geared Presses is every inch a champion. It is an outstanding example of the advanced thinking that has made Niagara the pace-setter among builders of metal working machines for 75 years.

Masterfully engineered and ruggedly constructed to handle a tremendous variety of work, the new Niagara SE Series is the most practical and dependable press line built for:

- Work requiring large die areas.
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THE COMPLETE STORY IS READY FOR YOU NOW!
Make a feature-by-feature appraisal of what these great new presses can do for you. Write for newly published, illustrated Bulletin 66. It will be forwarded promptly without obligation.

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Compactly and conveniently arranged on a master panel, Niagara controls are instantly accessible for fingertip direction of every press operation: starting, slide adjusting, jogging, die tryouts, running and stopping. The latest safety devices provide maximum protection for die setter, operator and the press itself. Nothing has been overlooked. Trial runs assure that all controls are in proper working order before each Niagara press leaves the plant.

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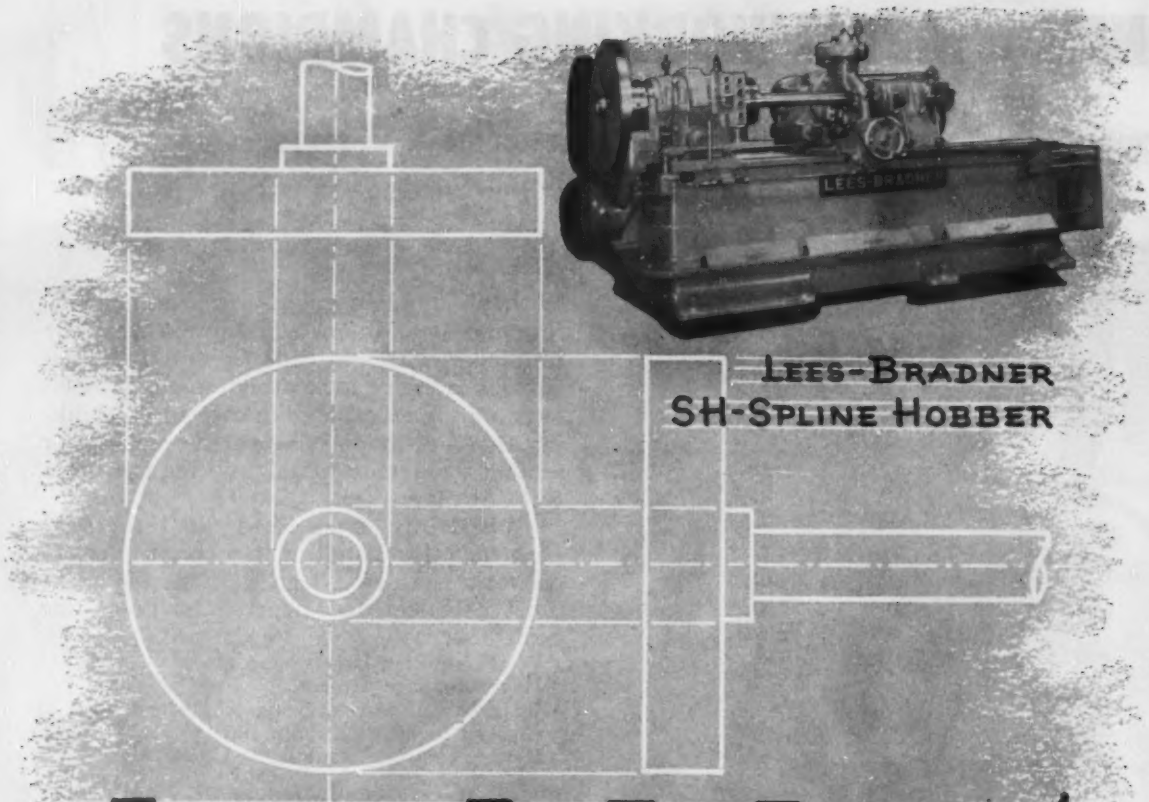

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SH-SPLINE HOBBER

FEATURES FOR THE FUTURE !

Your machine's future is *your* future. A second look at your equipment may indicate a *limited future;* a need for replacing tired, worn-out machines.

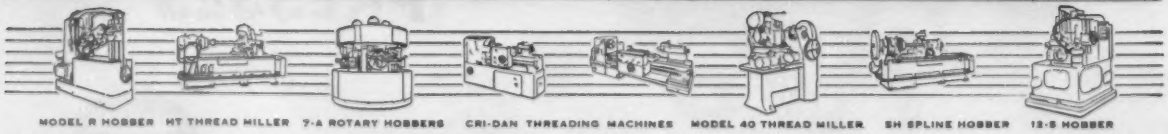
If so, it will pay you to think of Lees-Bradner first, an honored name in hobbing. And with that thought, remember to think of the Model SH spline hobbing machine, the machine with built-in *features for the future.*

An exclusive with the SH is its 6 inch capacity, "feed through spindle". It permits hobbing long and bulky parts with maximum speed and efficiency. Continuous splines up to 102 inches in length and 8¾ inches in diameter can be hobbed quickly, accurately. Spur and helical gears may be hobbed with equal ease.

But, get *all* the facts. See your Lees-Bradner representative, or write direct. No obligation, of course.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



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8 reasons why you should

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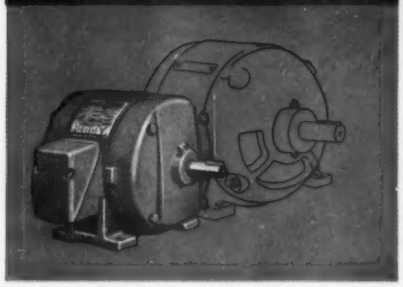
MORE POWER PER POUND



Lighter and smaller Tri/Clad '55' motors in new NEMA frame sizes and ratings save you space and weight, reduce handling costs.

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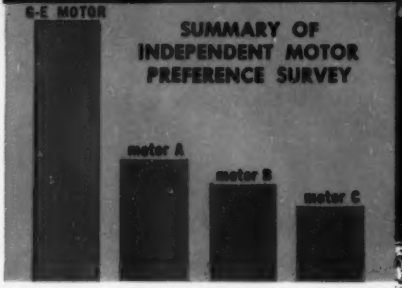

You take advantage of a 2 to 1 buyer preference for the electric motors on your equipment when you buy or specify a G-E motor.

BETTER PERFORMANCE

Quieter operation, proved by sound-room tests, is typical of the many performance improvements in the new G-E Tri/Clad '55'.

LONGER LIFE

A silicone Dri-film* coating makes insulation shed water—lengthens motor life. Polyester-film insulation is 8 times stronger.

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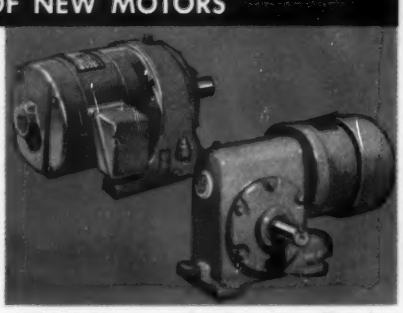
Perma-numbered leads are always instantly read even when wires are taped or clipped. Conduit box has plenty of knuckle room.

COMPLETE LINE OF NEW MOTORS

A complete line of new motors assures the right electrical drive for your machine. Write for Bulletin GEA-6013 on dripproof motors,



GEA-6012, on enclosed motors. For low speed jobs, G.E. offers a complete line of gear-motors. Write for Bulletin GEA-6027.

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Progress is our most important product

GENERAL ELECTRIC

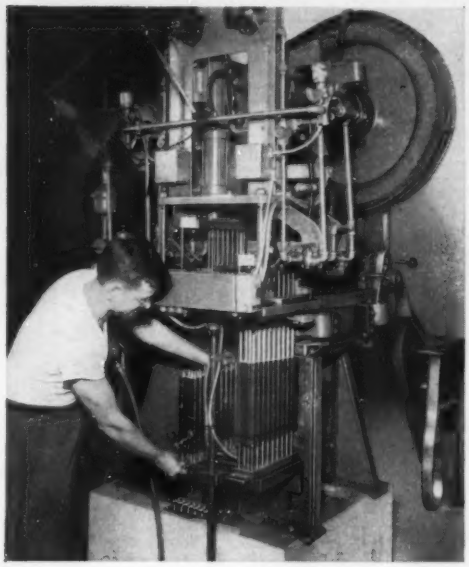
■ Automation needs exceptionally accurate, sturdy, trustworthy production machines. The high cost tooling and complex accessories do not permit anything less.

V & O has known all this for 65 years. The first V & O presses were designed because no others were adequate for automated tooling. The long slides, hand scraped ways, sturdyized features of V & O presses all were created for automation; all have been time-tested on highly automated operations. Our new controls and devices are designed solely for automation.

At V & O, automation is not a "new trend" with which to catch up. V & O never has had any other trend. That is why V & O presses can so easily put you ahead of the automation parade.

Write for the full story.

At the York Corporation plant this V & O corrugates, punches and flares copper fins; forms spacers; and stacks fins on copper tubes; all on a single machine.



why FOLLOW automation?

WHY THE V & O LONG SLIDE PROVIDES BETTER ALIGNMENT

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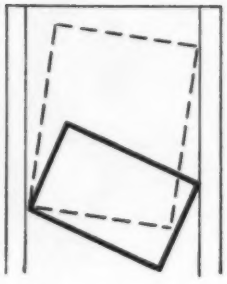

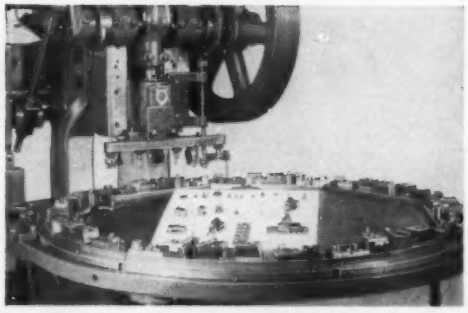

Long before the "automation craze" began, this 8 station dial feed V & O assembled the parts shown here, at the rate of 12 assemblies per minute.

THE V & O PRESS COMPANY

DIVISION OF EMHART MFG. CO.

HUDSON, NEW YORK

65th Anniversary

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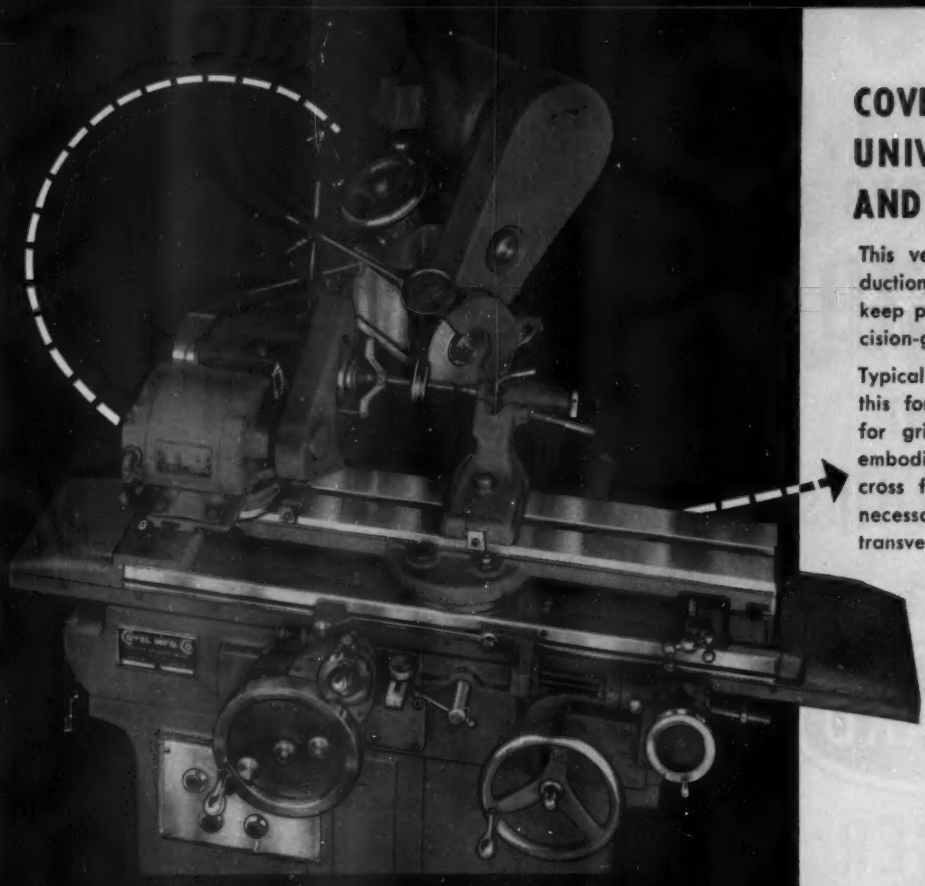
NEW PNEUMATIC CLUTCHES

V & O is now equipping presses with time-tested pneumatic clutches modified to provide improved economy, compactness and simplicity in press operation. They are unusually long-lived, self-ventilated, and designed to operate indefinitely with minimum maintenance. They increase the advantages of automation — and of better tooling.



COVEL NO. 12 UNIVERSAL CUTTER AND TOOL GRINDER

This versatile machine can get production off to a flying start — and keep pace with a steady flow of precision-ground, highly efficient tools.

Typical of No. 12's *universal* scope is this form grinding attachment set-up for grinding circular form tools. It embodies fine longitudinal feed—fine cross feed; for the extreme accuracy necessary for both longitudinal and transverse movement.

Write for
12-page detailed
Bulletin AM-174

PRODUCTION *Starts* IN THE TOOL ROOM

Look to your tool room — where production starts — and see whether your tool-makers and set-up men are hampered by obsolete, inaccurate and wasteful grinding equipment. Poorly ground tools and cutters handicap production every step of the way — through inferior results, costly rejects, loss of valuable time, expensive tool waste.

If your cutter and tool costs *are* high, perhaps you are *paying* for Covel quality without enjoying its many profit-saving advantages . . . and if so, now is the time to call on Covel for the answer. We will be pleased to send complete information.

80 YEARS of continuous manufacturing experience makes your COVEL choice a sound one

COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN

DRILL GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • HYDRAULIC & HAND FEED SURFACE GRINDERS

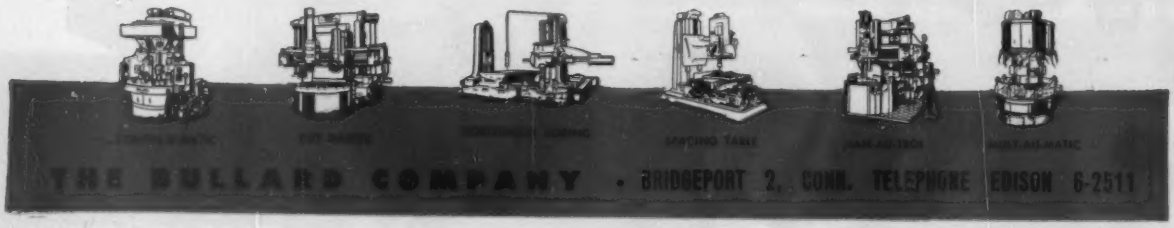
you have PRECISION at your finger-tips with a BULLARD SPACER

A call to your BULLARD Representative will convince you of the savings a Bullard Spacer will effect in your manufacturing methods, or write to...
The Bullard Company
Bridgeport 2, Connecticut

In plant after plant, in many diversified industries, The Bullard Spacer, day after day is convincing management and shop people alike, that where precision counts it is a "natural."

At the San Diego Division of Convair, a machine shop Superintendent says: "We have found the Bullard Spacer very useful in our work. The machine is simple to operate. It eliminates the necessity of zeroing to a set position. And there is no chance for error, which is important when you make accurate parts for airplanes."

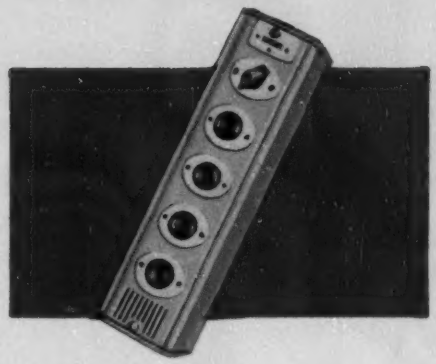
Accurate and precision drilling, reaming or tapping to exacting standards on difficult pieces without the high cost of jigs or fixtures, is maintained with a Bullard Spacer.



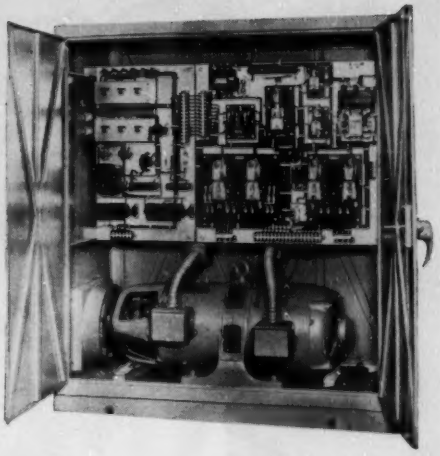
DIAL THE SPEED—CONTROL THE PROCESS

with a Performance Rated® Century SELECTIVE SPEED DRIVE

- **Offers automatic control integrated with your process.**
- **Covers a wide speed range—forward or reverse.**
- **Starts, stops—fast or slow.**
- **Allows forward or reverse jogs.**
- **Controls one or more motors.**

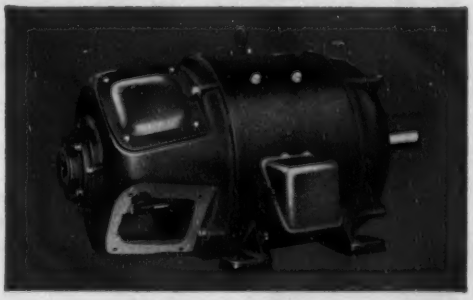


With a Century Performance Rated Selective Speed Drive, you can often integrate speed changes to cycle automatically as the process requirements dictate.



- You can automatically regulate metal cutting for optimum cutting speeds.
- Make the speed change automatically sensitive to changing temperature or pressure.
- Make the speed change automatically sensitive to changing diameter of a feed roll.
- Make the speed change automatically sensitive to the viscosity of a mix.
- You can use many different kinds of control devices in the control circuit to change speeds ... to jog ... to apply dynamic braking, etc.

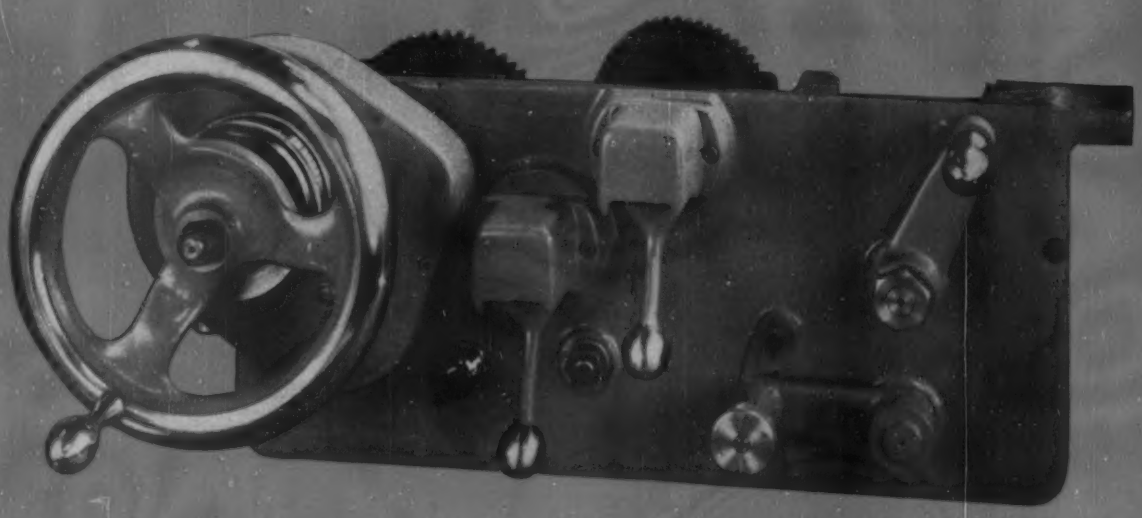
You're welcome to full information on your specific drive problem. Call your nearest Century District Sales Office or Century Authorized Distributor, or write direct. See telephone listings.

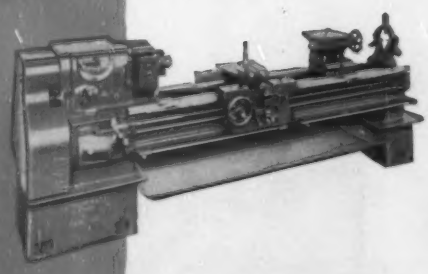


Century makes A. C. and D. C. motors
⅛ to 400 H. P.

Century C MOTORS

CENTURY ELECTRIC COMPANY
1806 Pine Street, St. Louis 3, Missouri
Offices and Stock Points in Principal Cities





1. All-geared headstock
2. 12 spindle speeds in geometric progression
3. One-shot lubrication of carriage ways and cross slide
4. Ground bedways (flame hardened at extra cost)
5. Tapered key drive spindle nose
6. Multiple-disc clutch and brake
7. 32 thread and feed changes
8. Forged steel spindle and all headstock shafts mounted in precision antifriction bearings

For complete catalogs, prices and name of your local dealer, write on company letterhead to Cincinnati Lathe & Tool Co., 3248 Disney, Cincinnati 9, Ohio.

A Quality Lathe Apron

A glance tells you it's built for convenience and safety. There are two spindle start-stop levers, one located on the apron, for ease of operation. The chasing dial is built in. The independent drop levers for cross and longitudinal feed, lift to engage. This disengages feed if an object falls on them. For extra convenience, the oil shot plunger is also located on the apron.

is Standard on 16" Cincinnati LT Lathes costing only $4829*

The wide range of work these lathes will handle, plus their low initial and maintenance costs, assures a fast return on your investment. They are the only low-priced lathes in their class with high-priced features:

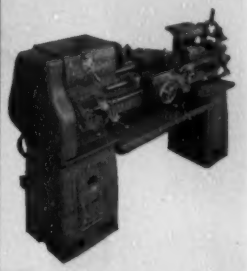
*16" x 30" including motor and controls F. O. B. factory. Prices subject to change without notice. Direct reading length dial shown is available at extra cost.

center on . . .

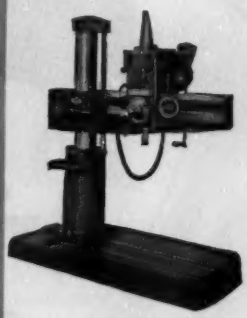
cincinnati lathes and drills

For a clear comparison of Cincinnati Lathes with other equipment, write for a free copy of "Management Facts About Lathes".

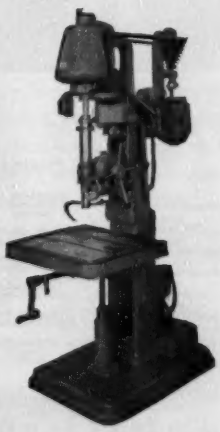
There is also a complete line of Tray-Top Lathes and Cincinnati Floor, Bench and Radial Drills



Light-duty Tray-Top Lathes (10" to 18" swing)

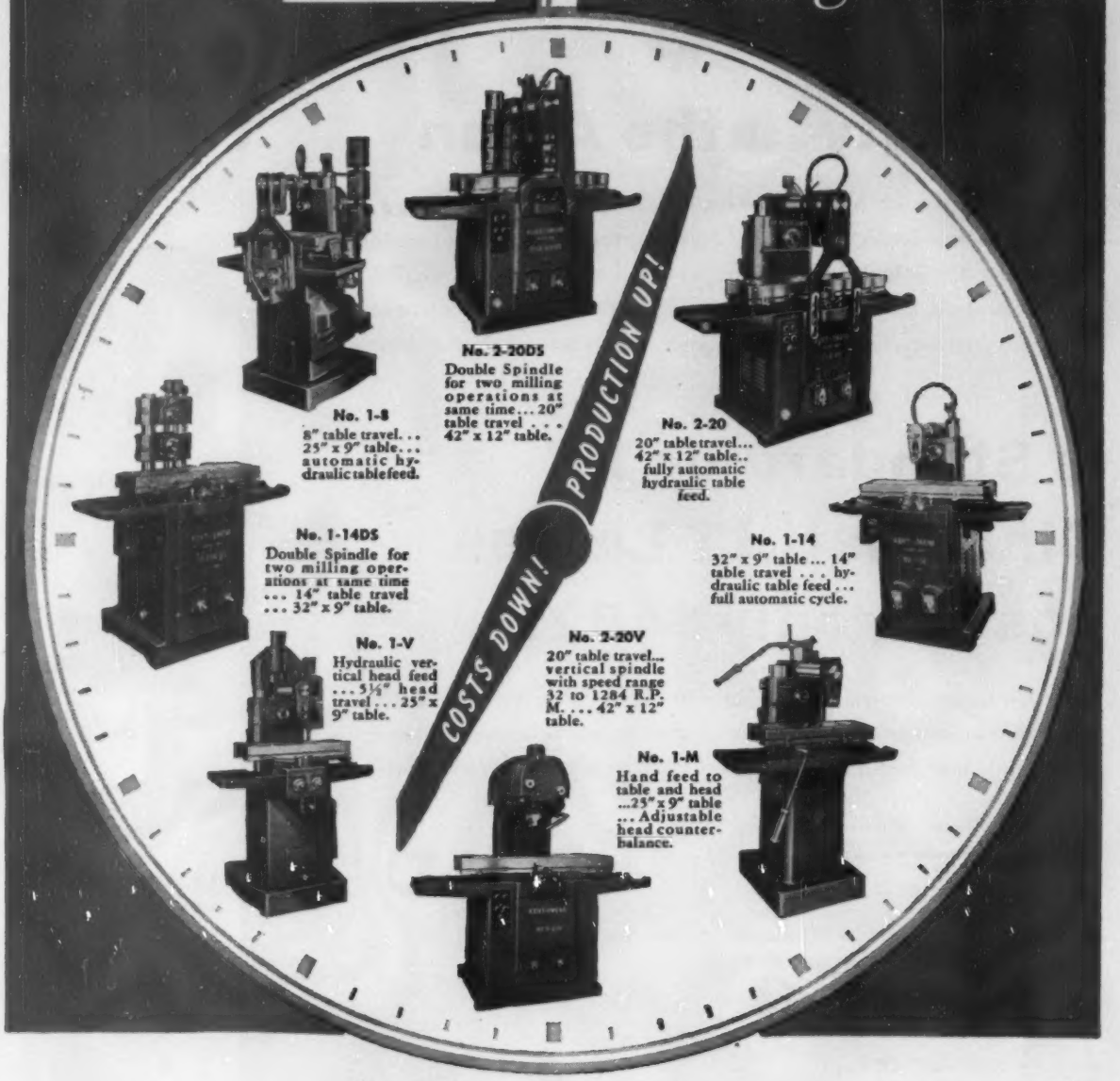


Radial drills (3' arm, 7" column)



Drilling machines, floor and bench (sizes 16", 18" and 21", illustrated, 21" slider)

Time to *Reduce* Milling Costs!


COSTS DOWN! PRODUCTION UP!
No. 2-20DS
Double Spindle for two milling operations at same time... 20" table travel . . . 42" x 12" table.
No. 1-8
8" table travel... 25" x 9" table... automatic hydraulic table feed.
No. 2-20
20" table travel... 42" x 12" table.. fully automatic hydraulic table feed.
No. 1-14DS
Double Spindle for two milling operations at same time ... 14" table travel ... 32" x 9" table.
No. 1-14
32" x 9" table ... 14" table travel . . . hydraulic table feed . . . full automatic cycle.
No. 1-V
Hydraulic vertical head feed ... 5½" head travel ... 25" x 9" table.
No. 2-20V
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M. ... 42" x 12" table.
No. 1-M
Hand feed to table and head ...25" x 9" table ... Adjustable head counterbalance.

KENT-OWENS REPRESENTATIVES

BOSTON
General Machinery Corp.

BUFFALO
Don W. Patterson

CHICAGO
Four States Mach'y Company

DALLAS
Hunter Machine Tool Co.

DAYTON
C. H. Gosiger Mach'y Co.

DETROIT
A. C. Haberkorn Mach'y Co.

FT. WAYNE
Ossis Machinery Co.

GRAND RAPIDS
Joseph Monteblo

HAMILTON, ONT.
E. P. Barber Mach'y Company

HARTFORD
Huntington Machinery, Inc.

HOUSTON
Oliver H. Van Horn Co., Inc.

INDIANAPOLIS
Ossis Machinery Co.

KANSAS CITY
Richman Machinery Co.

LOS ANGELES
Cosmopolitan Mach'y Co.

MILWAUKEE
Four States Mach'y Company

MINNEAPOLIS
The Jamesbee Company

MOLINE
John J. Normoyle Co.

MONTREAL
E. P. Barber Mach'y Co.

NEW ORLEANS
Oliver H. Van Horn Co., Inc.

NEW YORK
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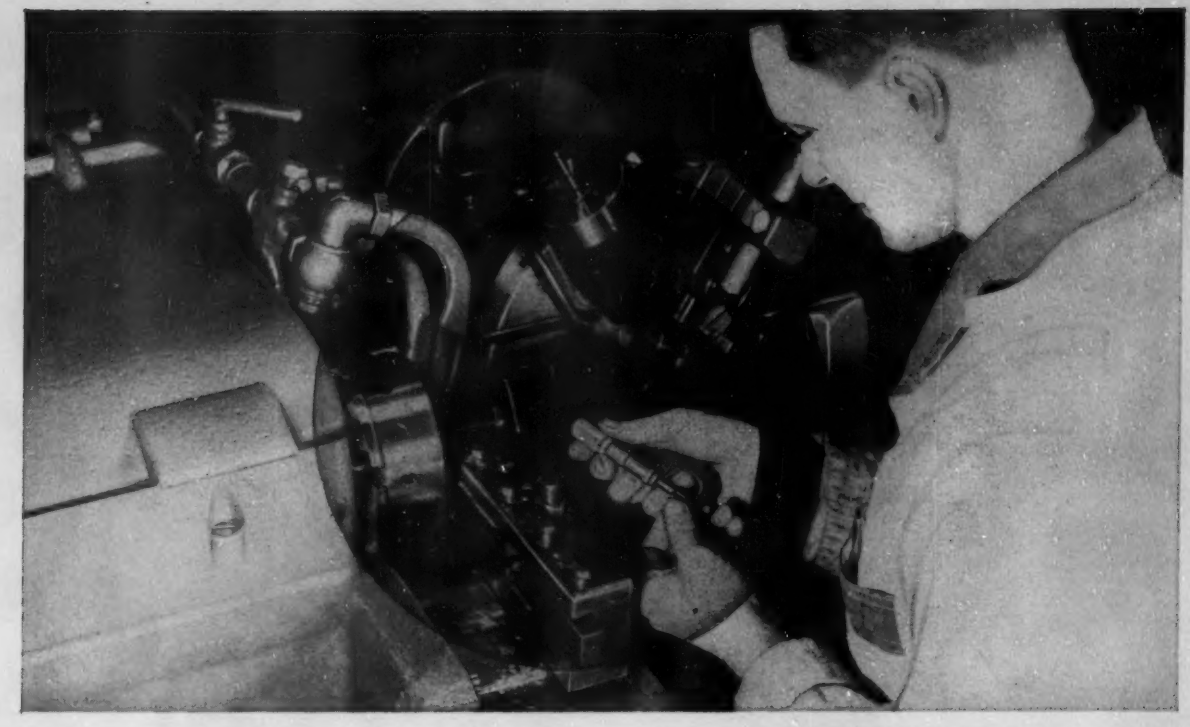
WINDSOR, ONT.
E. P. Barber Mach'y Company

Kent-Owens machines assure you of speed with accuracy... and cut your milling costs! Designed with advanced features . . . performance-proved for meeting tough schedules in production milling. Rugged . . . simple . . . versatile. Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to cutter. Write for bulletins on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, Ohio.

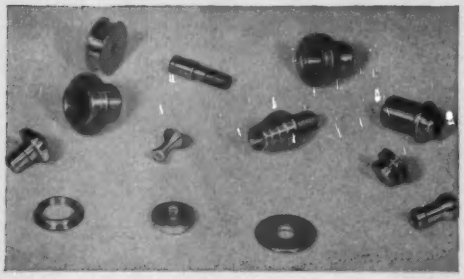
Call on

KENT-OWENS

for Milling Machines



TOOL LIFE INCREASED 40% USING CITIES SERVICE CUTTING OIL



ONE OIL FOR ALL? After poor results with many cutting oils, the Dunbar Machine & Tool Company discovered all their cutting jobs could be done to perfection using only one oil . . . Cities Service Chillo #44.

NO EYE STRAIN. In addition to a 40% increase in tool life, owner Robert Dunbar found that the transparent characteristics of Chillo #44 help eliminate eye strain. Cutting operation is easily visible to operator.

Production Also Up, Reports Dunbar Machine & Tool Co.

THE PROBLEM . . . The Dunbar Machine & Tool Company had a problem. It seemed impossible to find one oil which would perform economically and efficiently for ALL the jobs required of the firm's automatic screw machines.

THE SOLUTION . . . After trying many brands of cutting oil, "none of which gave good all-round performance," owner Robert Dunbar called in a Cities Service engineer. After careful analysis of the problem, the engineer recommended Chillo #44 cutting oil.

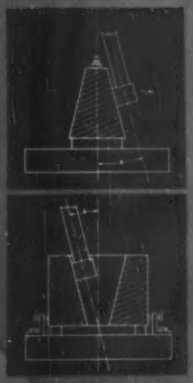
THE RESULTS . . . Using Chillo #44, the company observed these results: Tool life increased nearly 40% . . . Production increased accordingly . . . Additional savings realized due to chip draining characteristics of oil . . . Holding tolerances no longer any problem . . . Machine clean-up time now insignificant . . . Transparency of oil eliminates eye-strain . . . Less smoke and fumes at high speeds . . . Also excellent for lubricating purposes. Says Mr. Dunbar, "Our results with Chillo #44 permit us to heartily endorse this product."

If you have a cutting oil problem, consult your nearest Cities Service representative or write Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

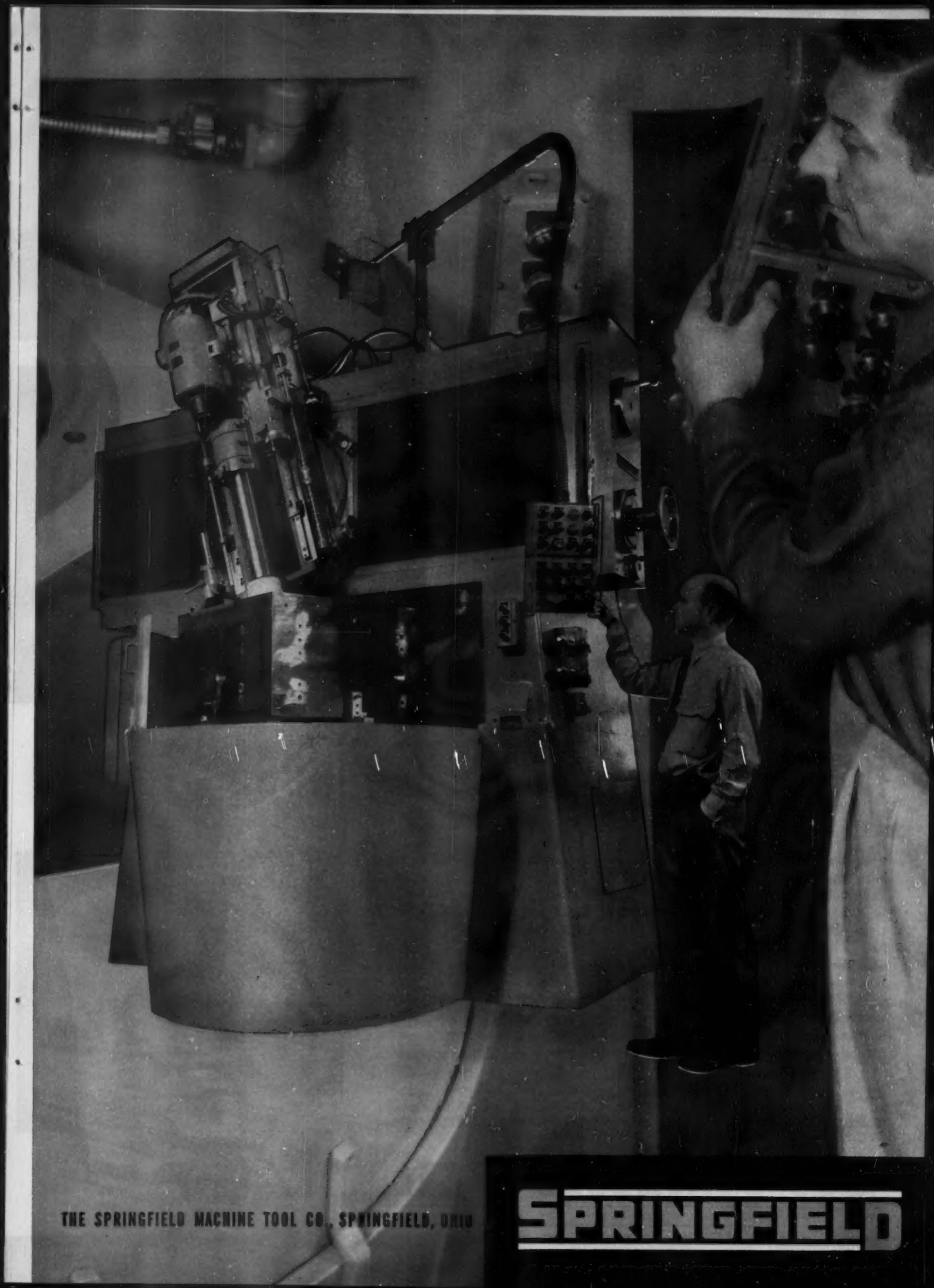
52″swing plus...



The work piece on the grinder here is a washing machine agitator mold, 43″ corner to corner. A tapered hole through it must match a conical male part (small illustration). One angle setting of the head ground both male and female taper for perfect fit. It had been planned to hand-lap them, a week's task. Springfield's time: 4½ hours.

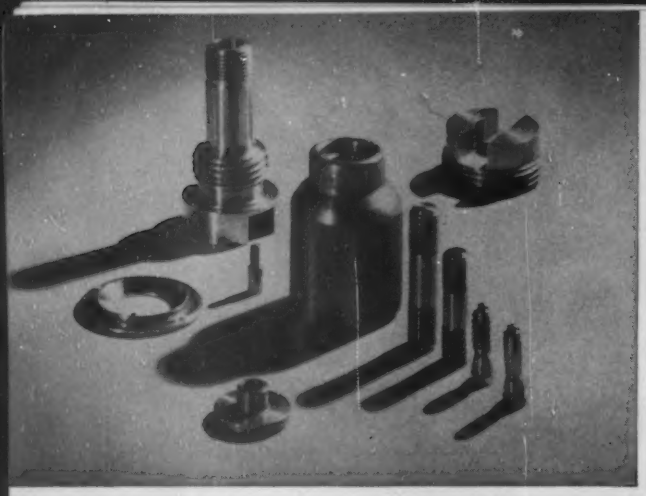
Other Springfield Vertical Universal Grinders—swings 21″ and 30″.
Lathes—toolroom, engine, contouring, reproducing—14″ to 32″.
Write for name of nearest Springfield dealer.

67TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS



THE SPRINGFIELD MACHINE TOOL CO., SPRINGFIELD, OHIO

SPRINGFIELD



You can produce parts like these *better* from bar stock of USS Stainless Steel

● When you buy USS Stainless Steel bars, you can be sure of getting the bar stock that is just right for your product—and your machining operations. That's because United States Steel's bar mills offer you the widest selection of grades, shapes and sizes in the industry.

USS Stainless Steel bars are available in rounds, hexagons and all other shapes you may require. They are available in almost every grade, including several free-machining types. They are furnished cold finished and hot rolled in sizes from the smallest to the largest you could conceivably need.

Our Stainless Steel representatives will work with you in selecting the right bar stock for your product and your machining operations. The result will be a better product and, in many cases, lower costs in production.

On-the-spot service

on Stainless Steel bars

For prompt service on immediate requirements, call your Stainless Steel warehouse distributor. He can offer you unbeatable delivery on USS Stainless Steel bars.

USS

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS STAINLESS STEEL

SHEETS • STRIP • PLATES • BARS • BILLETS • PIPE • TUBES • WIRE • SPECIAL SECTIONS

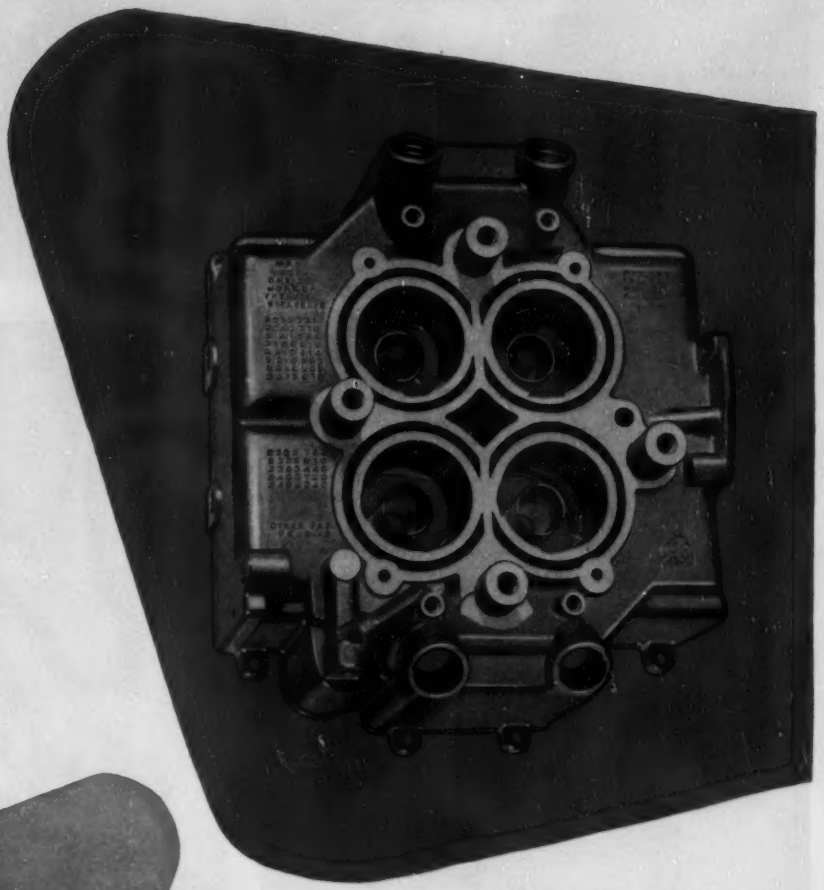
4-1055

UNITED STATES STEEL

How would you do all these operations?

. . . fast, with utmost precision, at lowest cost

DRILL	2	HOLES
TAP	2	HOLES
DRILL	2	HOLES
REAM	2	HOLES
TAP	2	HOLES
FACE	4	SURFACES
CLEANOUT	4	DIAMETERS
FACE	4	SURFACES
TAP	2	HOLES
REAM	2	HOLES
DRILL	2	HOLES
TAP	2	HOLES
DRILL	2	HOLES



Here's the Morris Mor-Speed answer

. . . combining 32 operations, delivering up to 375 parts per hour!

Imagine the machines, and floor space required to do this part on a separate machine basis! Instead, there's just one machine, producing approximately six parts per minute!

Important too, there's no sky-high "special machine" price tag on this or any Morris MOR-SPEED. Standard machining units are grouped on a standard base, around a standard indexing table and provided with the necessary tooling. The result is high production at lowest cost.

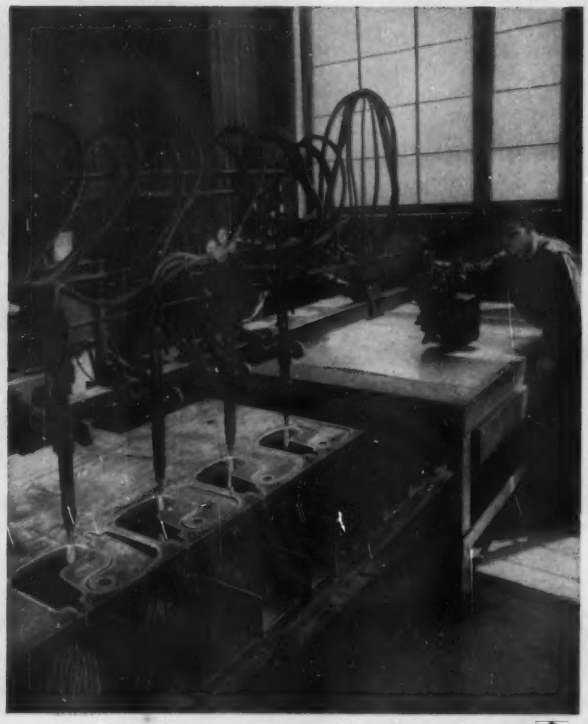
Although your multiple drilling, tapping, reaming and similar operations may not be as complicated as this Morris installation, chances are Morris Engineers can show you proof of substantial savings. Investigate today.

Morris

THE MORRIS MACHINE TOOL COMPANY, 933 HARRIET ST., CINCINNATI 3, OHIO

Delivering industrial "breath"—Oxygen supply and servicing is as important as its unit price and purity. Airco customers get a dependable, flexible supply service from a network of 70 producing plants situated strategically throughout the country. Delivery, by bulk truck (far right), in cylinders, or by direct pipeline is quick and dependable. Right: valve opening ceremony last year at the new Airco liquid oxygen plant, Butler, Pa. These pipelines deliver oxygen to Armco Steel and Pullman Standard steel plants.

New welding process speeds production – Among industry's newest production tools is the Aircomatic® process. The method greatly increases the speed with which good welds can be made in a wide variety of metals and alloys, including "problem" materials like aluminum and stainless steel. This photograph shows the inert-gas-shielded metal arc of an automatic Aircomatic head welding truck-trailer dolly wheels from press-stamped SAE 1020 steel at Youngstown Steel Car Corp., Niles, Ohio. Oxygen plays an important part here as an additive to the shielding gas.



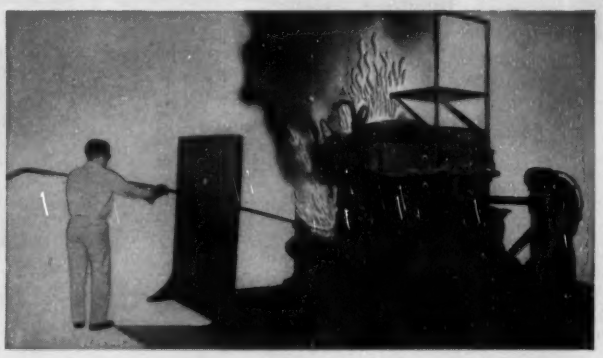
Most dramatic use of oxygen – Flame cutting is perhaps the most spectacular industrial application of oxygen . . . as useful as it is striking. The oxygen-acetylene flame used generates 6300°F-heat. This temperature permits cutting metal thicknesses ranging from sheet to heavy ingots. Here, an operator at Brown-Wales Co., New England steel warehousing firm, cuts steel plate with an Oxygraph equipped with Electronic Tracer, one of the Airco precision machines that has brought flame cutting to a peak of usefulness.

AIRCO®

Airco Oxygen Tent for Industry

The vital importance of oxygen to industry is relatively new. Forty years ago, the market for oxygen in cutting and welding and allied uses was virtually nonexistent. The rapid growth of industrial oxygen consumption has been nourished by three conditions: an expanding economy, the wider use of *any* effective product in healthy conditions of economic expansion, and the development of new and improved tools and techniques whose effectiveness depends on oxygen. For details of these and other applications of Airco products, write for a sample copy of the magazine, "Airco in the News."

Oxygen in the glass industry—Insatiable demand for light bulbs, electronic tubes, and similar glass components has brought modern mass production methods to the old art of the glass blower. This "sealing-in" machine at Sylvania Electric Products, Inc. seals bulbs and mounts into 150-watt inside frosted incandescent lamps at a 1500-per-hour rate. A mixture of oxygen-enriched air and natural gas provides the right flame shape and temperature in the jets that soften the throats of the bulbs prior to sealing.



Needling steel for production economy—Oxygen has replaced iron ore as an oxidizing agent in most steel mills with electric furnaces. Here at Mid-Continent Steel Castings, Shreveport, La., a long pipe injects the oxygen directly into the molten steel. Advantages of this Airco-pioneered process are savings in time, power, furnace electrodes and valuable alloy elements. Other oxygen applications include flame cutting of heavy scrap, scarfing, flame cleaning, oxyacetylene welding, dehydrating, hardfacing, and gas hot topping of ingots.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AIR REDUCTION

60 East 42nd Street • New York 17, N. Y.
Air Reduction Sales Co. • Air Reduction Pacific Co.
Represented Internationally by Airco Company International
Divisions of Air Reduction Company, Incorporated

OFFICES AND DEALERS IN MOST PRINCIPAL CITIES

one stands out

...and REX is the standard by which all high speed steels are compared

It takes exceptional skill *and* experience to make consistent scores on the target range . . . or to produce consistently superior high speed steels.

Crucible has been making REX® High Speed Steels for over half a century . . . and REX is still the standard of comparison wherever high speed steels are used. That's no idle claim . . . and you can prove REX's superiority for yourself by putting a piece to work in your own shop. You'll like its hardenability, response to heat treatment, and good tool performance.

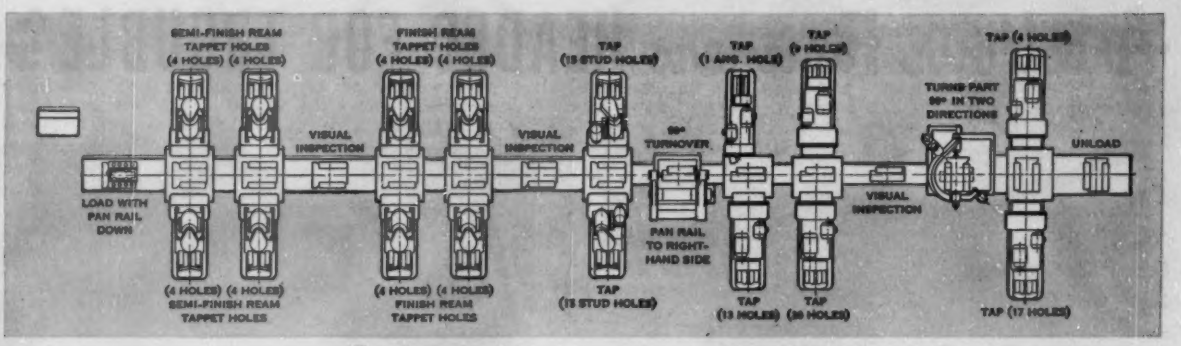
Once you've tried it, we think you'll agree — *you can't find a high speed steel that will outperform REX.*

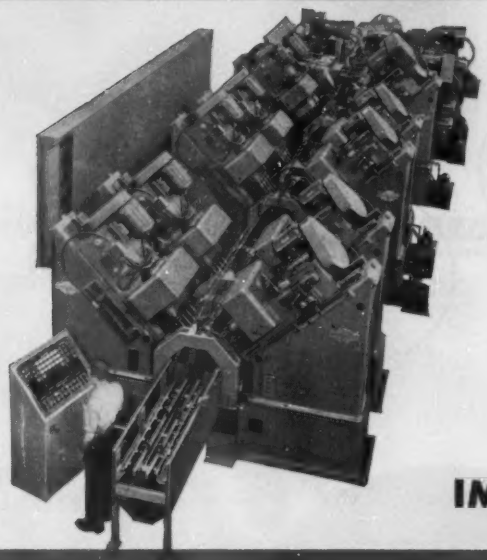
CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **TOOL STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

Canadian Distributor — Railway & Power Engineering Corp., Ltd.


SEMI-FINISH REAM TAPPET HOLES (4 HOLES) (4 HOLES)
VISUAL INSPECTION
FINISH REAM TAPPET HOLES (4 HOLES) (4 HOLES)
VISUAL INSPECTION
TAP (15 STUD HOLES)
90° TURNOVER
TAP (1 AUX. HOLE)
TAP (9 HOLES)
TURN PART 90° IN TWO DIRECTIONS
TAP (4 HOLES)
UNLOAD
VISUAL INSPECTION
LOAD WITH PAN RAIL DOWN
PAN RAIL TO RIGHT-HAND SIDE
(4 HOLES) (4 HOLES) SEMI-FINISH REAM TAPPET HOLES
(4 HOLES) (4 HOLES) FINISH REAM TAPPET HOLES
TAP (15 STUD HOLES)
TAP (13 HOLES)
TAP (30 HOLES)
TAP (17 HOLES)



SOME NEW IDEAS FOR MACHINING AUTOMOBILE V-8 CYLINDER BLOCKS

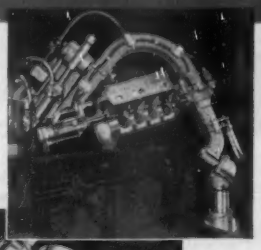
On this new automatic transfer machine — one of the latest in the long series pioneered by Greenlee — automatic handling and repositioning of the block provides some new accomplishments. Two repositioning stations permit the units of the machine to work on the block from *six* different directions. Instead of being slid along the rails, the work is *lifted and carried* between positive locating fixtures at each position.

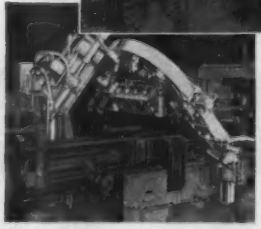
UNIQUE ELEMENTS IMPROVE PERFORMANCE OF

GREENLEE

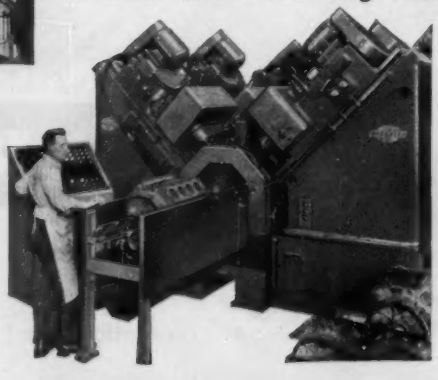
TRANSFER MACHINE

The unusual repositioning unit shown at the left, plus a number of other distinctive Greenlee features, enable the user of this machine to achieve new high standards of quality and production.





Above, two views of the "half-twist" repositioning unit which relocates the block 90° *in two directions simultaneously*, rolling it half over and also turning it from endways to crossways of the machine.



Left, the "front" end of the machine where the partly-finished block is easily rolled into proper position for the transfer bar to lift and carry it automatically into the first machining unit, where it is positively located and clamped for the tool-feed cycle.

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1728 MASON AVENUE
ROCKFORD, ILLINOIS

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

Are Your Fasteners HEADED FOR TROUBLE?

Screws are sometimes like people. If they "lose their heads" under pressure — if they turn out to be "softies" — if they don't "square up," they are *headed for trouble*. It takes only a few "bad" screws on the line each day to erase most planned assembly savings.

That is why quality standards for P-K Self-tapping Screws were set so *high* when they were first introduced by Parker-Kalon. Today, with even *higher standards* they continue to take top honors for dependability, despite many efforts to match them.

The difference between screws made to P-K standards and those that are "headed for trouble" are hard to see at a glance, but the effects of screw failure (parts spoilage, high reclamation costs) are quickly evident in mounting assembly costs.

P-K Self-tapping Screws are "headed for savings"—not only headed, but threaded, pointed, and heat-treated with the same purpose, to keep your assembly lines trouble-free. That's why so many more manufacturers of America's best known products specify P-K. For information on any fastening problem, talk to a P-K Assembly Engineer. Or write: Parker-Kalon Division, General American Transportation Corporation, 200 Varick St., New York 14.

IS HEAD UNDERSIZE?
DO HEADS POP OFF?
IS HEAD ECCENTRIC?
IS SLOT BURRED?
IS SLOT TOO DEEP?
IS SLOT TOO SHALLOW?
IS SLOT OFF CENTER?
P-K STANDARDS make sure you get fasteners HEADED for SAVINGS

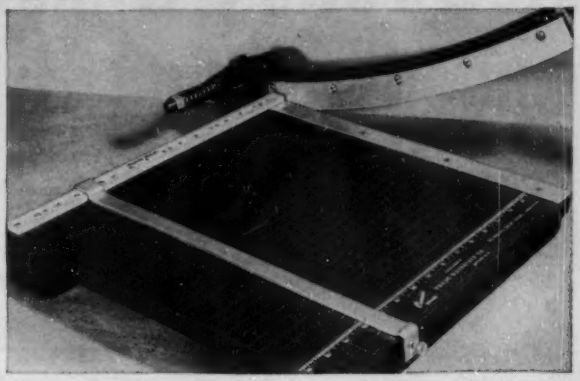
P-K STANDARDS protect you against these and many other symptoms of Screws "headed for trouble". They don't "get by" P-K inspectors — that's why *all* P-K Self-tapping Screws can be "Guaranteed First Quality."

PARKER-KALON

IN STOCK . . . see your nearby P-K Distributor . . .

"SWINGIN' SPRAY," MELNOR Products Co.'s popular lawn sprinkler keeps on "swinging" because the oscillating mechanism is separate and sealed from the water intake system. To assure equally dependable assembly strength resistant to the roughest handling, Melnor fastens zinc and aluminum parts with P-K Screws, 7 Phillips Head Type Z and 18 Type F, driven with air tools.

IN THE PREMIER CUTTING BOARD, made by Photo Materials Co. when 21 P-K Type A replaced wood screws to fasten the ruler, straight blade, bearing casting, and bottom cleats to the hard maple board, pilot holes were eliminated. The 5 P-K Type F Screws that now fasten curved blade to cast iron handle ended tapping. Power driving further speeds assembly.



with P-K quality—planned assembly savings pay off

HOOVER SMOOTHED OUT trouble and speeded assembly of this Steam or Dry Iron by switching to P-K Self-tapping Screws for seven fastenings previously made with machine screws. Tapping and lock washers were eliminated. The assembly is made stronger than ever, with an important saving in time. Five P-K Type F Screws fasten the phenol formaldehyde handle to the sole plate cover (left). On the assembly line, these screws are power driven. One P-K Type F Screw fastens the steam valve control support bracket to the die-cast aluminum filler tube at the front of the iron (not shown). One P-K Type A Screw fastens the heel closure plate to the terminal bracket (right).

The Original

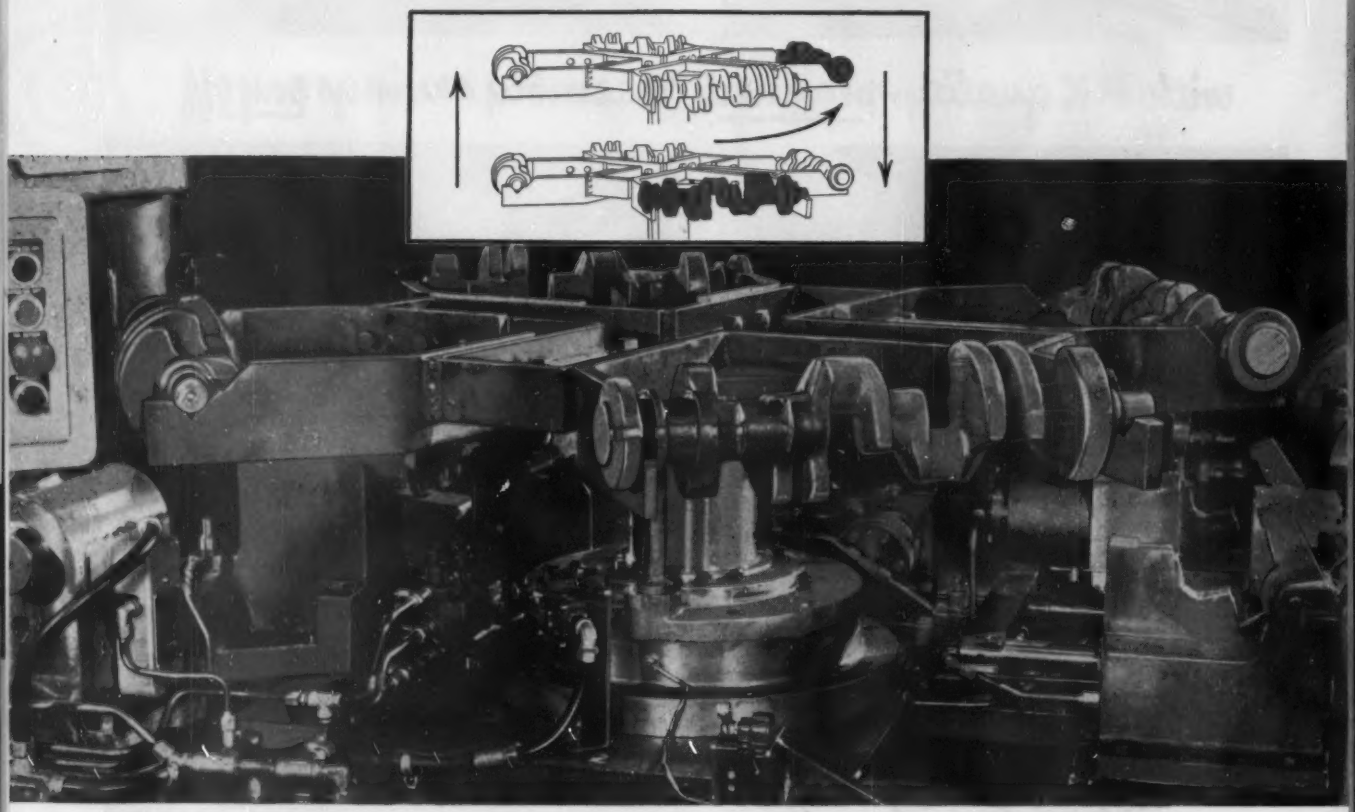
SELF-TAPPING SCREWS

your local Supply and Service Specialist

AUTOMATION TRENDS:

New rotary transfer design speeds milling, drilling and notching operations on crankshafts

Suggests new high-production possibilities for you



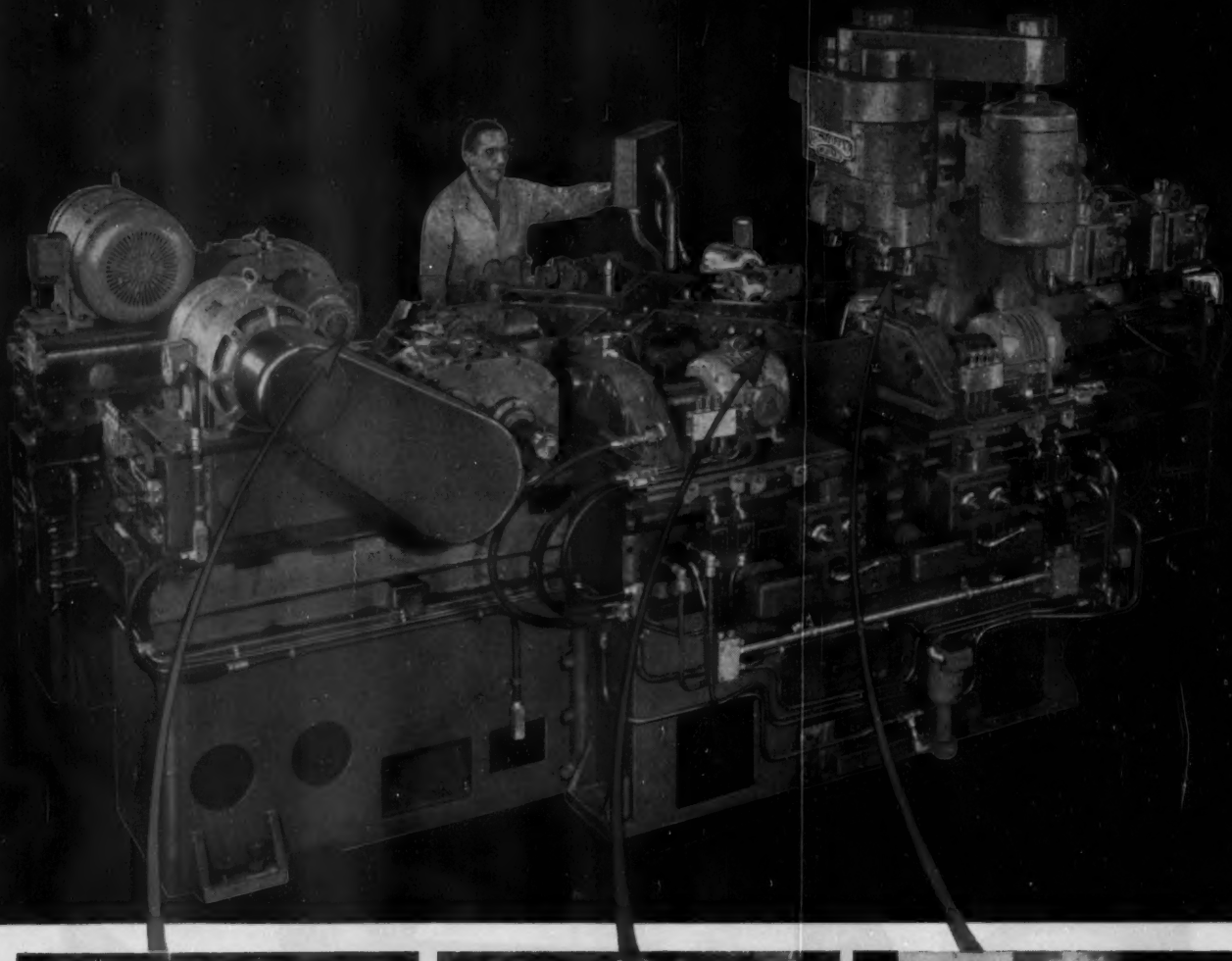
Hydraulic transfer unit of Kearney & Trecker's 4-Station Rotary Transfer machine is shown in raised position. Each of four arms carries one crankshaft. Diagram (above) illustrates vertical and rotational movement of transfer unit.

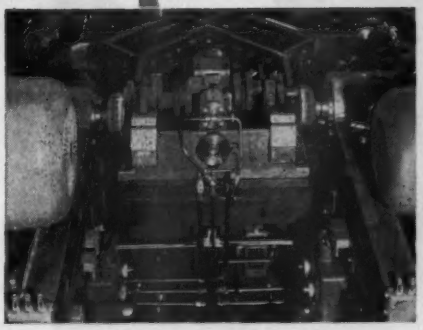
ANOTHER example of recent advances in production machine design is this Four-Station Rotary Transfer machine, shown at right, developed and built by Kearney & Trecker's Special Machinery Division. Engineered for high-speed production, the machine mills and center-drills the ends and mills the locating notches on automobile crankshafts. Production rate is 108 pieces per hour.

One of the outstanding design features incorporated in the machine is a special hydraulic rotary transfer mechanism which delivers the workpieces in sequence to machining stations where they are clamped by automatic fixtures. In addition, the machine comprises one drilling and two milling units all fastened to a common base. Three automatic hydraulic clamping and locating fixtures are also secured to the machine base.

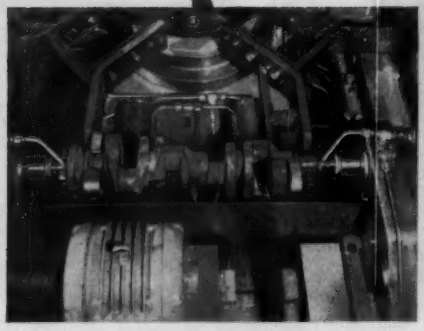
Here's how the rotary transfer unit helps to speed production. It raises four crankshafts at once... rotates and then lowers them into hydraulic clamping fixtures. Positive positioning is assured by a tapered rod mounted on the machine base which locates into one of four accurately drilled holes with inserted hardened bushings on the transfer unit base.

If you are faced with production problems that require special machinery — find out how Kearney & Trecker engineering and Special Machinery Division can serve you. Contact your Kearney & Trecker representative today.

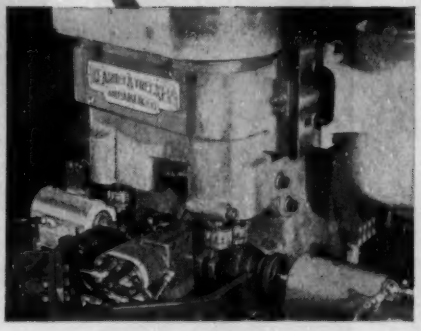




At the first machining station, crankshaft ends are milled to length by two horizontal spindles carrying 6-in. dia. cutters. Spindles are powered by 10-hp and 7½-hp motors.



Ample coolant is supplied to the third machining station where crankshaft ends are center-drilled. Each of the two horizontal spindles is powered by a ¾-hp motor.



Six-spindle head, mounted on positioning saddle, mills locating notches on crankshaft. Head advances to a positive stop, moves to left, completes operation and returns.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Special Machinery Division

MILWAUKEE 14, WIS., U.S.A.

KEARNEY & TRECKER CORPORATION
Special Machinery Division
6784 W. National Ave.
Milwaukee 14, Wisconsin

Please send me Data Sheet No. 1036 with details on Four-Station Rotary Transfer Machine. ☐ Check here if you would like to have a representative call on you as soon as possible (or call Milwaukee, GReenfield 6-8300)

Name_____

Title_____

Company_____

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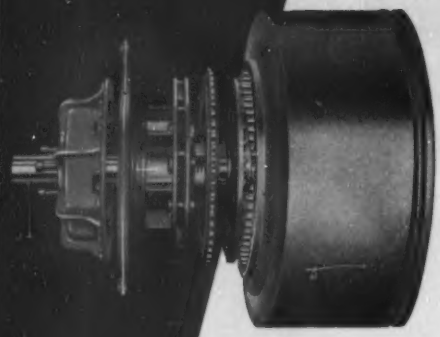
Columbia
STEEL SQUARING SHEARS
up to 75% less gear wear
with the exclusive air clutch!



Exploded View of Air Operated Disc Clutch

. . . another Columbia exclusive. It eliminates unnecessary gear wear

. . . gives never-failing overload protection

. . . cushions shock!

A cost-reducing, safety Air Clutch is one of the many exclusive, built-in Columbia "New Series" Shear features.

This air-operated clutch reduces gear wear as much as 75% since all gear movement is eliminated except in the actual cutting cycle. Inherent clutch slippage at the overload point protects machine and drive. Air-application of power is soft; shocks are not transmitted.

Other Columbia features you should know about include the exclusive Quick-Set Blade Clearance, Hydraulic Hold-downs, Jog Control for Ram Back Brace Adjustment, Air Counterbalances, Remote Foot Switch, and others. Together with basic ruggedness, rigidity and long-lasting accuracy these features mean that Columbia Shears offer more machine for the money!

Columbia Steel Squaring Shear, Model 0610. Capacity 10' x 3/8".

Other exclusive Columbia features are explained in detail in FREE Bulletin No. PS-2. Write for it and the name of your Columbia dealer, *today!*

COLUMBIA DIVISION, THE LODGE & SHIPLEY CO.
HAMILTON 2, OHIO

new series Columbia STEEL SQUARING SHEARS and POWER PRESS BRAKES

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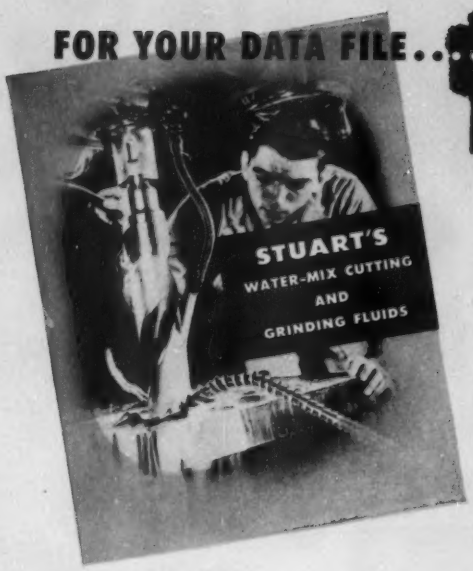

a *NEW GUIDE* to SOLUBLE OIL SELECTION

Every industrial lubricant is measured by its performance. Water-mix cutting and grinding fluids are no exception... it still takes the *right* oil to do the *best* job!

Stuart Oil Company's guide on water-mix cutting and grinding fluids is intended as a help when you're selecting a water-mix for the shop. It provides information and background on water-mixtures that you should know.

"The Man in the Barrel," your Stuart Representative, will be pleased to provide further information and help when you're selecting a water-mix fluid. Send for your book today and ask to have "the Man in the Barrel" call, too.

DASCO

Two water-mixes built into one. Dasco Super Soluble Base is a heavy-duty water-mix cutting and grinding fluid of unusual versatility. Superior performance is provided in mixtures of 1-40 and higher for turning, milling, reaming, drilling and boring, and 1-100 and higher for grinding. Provides excellent stability and resistance to rancidity.

KLEENKUT

A *conventional* type soluble oil to perform such jobs as light milling, turning, drilling, boring and others. When used for those run-of-the-mine soluble jobs, Kleenkut provides something *extra* with more uniform performance, greater stability, improved detergency, better emulsibility and high anti-rust value.

SOLVOL

An emulsified heavy-duty cutting oil that is especially effective on the more severe applications where ordinary type soluble oils fall short of meeting tool life and finish requirements. Solvol provides a balance of cooling and lubricating value rarely equalled in a water-mix product.

CODOL

Stuart's water-mix liquid grinding compound that has been specially designed to reduce wheel loading. It provides adequate heat dissipation, anti-rust protection and a carefully balanced surface tension to carry away chips and abrasive particles. Codol is Stuart's step *beyond* conventional water-mix grinding fluids.

More than a "Coolant" is Needed

D. A. Stuart Oil Co.
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TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

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Please send me a copy of Stuart's Water-Mix Cutting and Grinding Fluids book.

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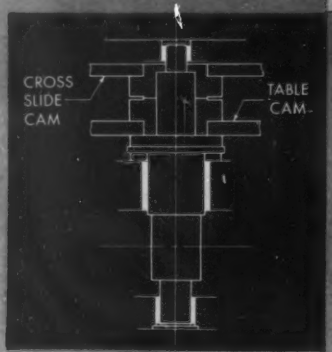
New!

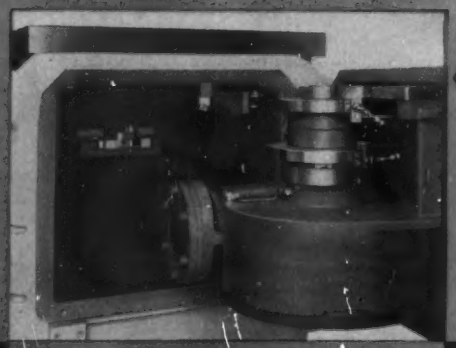
XLO
EX-CELL-O for PRECISION

Flame Hardened Ways

Rugged — For Tough Jobs. The base is a heavily ribbed nickel iron casting.

Drawing shows the 3-bearing shaft which supports the cams.



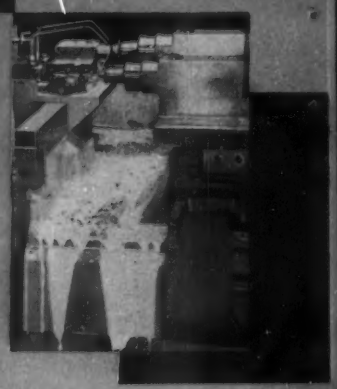


Cams Changed in *Minutes*

Just open the cam compartment and the cam assembly swings out for quick change of operation. All motors are outside the base.

Chip Problem Solved

Large chip chute is cast integral in the solid top of the base. There are no openings; chips or coolant cannot enter the base.



Direct Cam Action

★ NO LEVERS !

IN THE NEW STYLE 312 EX-CELL-O PRECISION BORING MACHINE

★ Fast

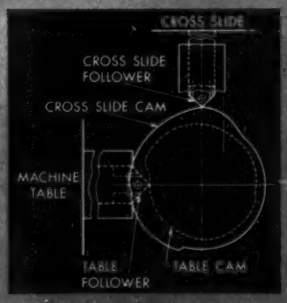
★ Accurate

★ Automatic

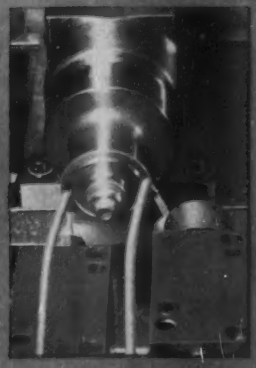
A New Method by EX-CELL-O

Direct Cam Action (NO LEVERS) for Sturdier Control

Added to Ex-Cell-O's line of Precision Boring Machines is the new Style 312, for precision contouring, boring, turning, facing and grooving operations.

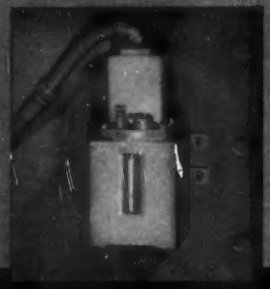


Drawing shows the contouring action. Note that cams act directly on the slides. THERE ARE NO LEVERS. There are separate cams for table and for cross slide, both being on one shaft to insure exact coordination.

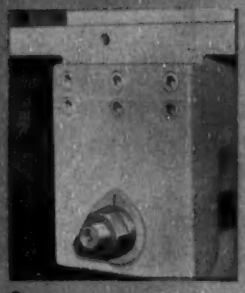


Close-up view of a two-tool contouring operation on an aircraft washer. The part is chucked on the spindle; tools are carried on the cross slide.

Spindle is lubricated permanently.



Ways are lubricated automatically by pump.



Size Control

Graduated adjustment, on end of machine, positions the table relative to the work.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

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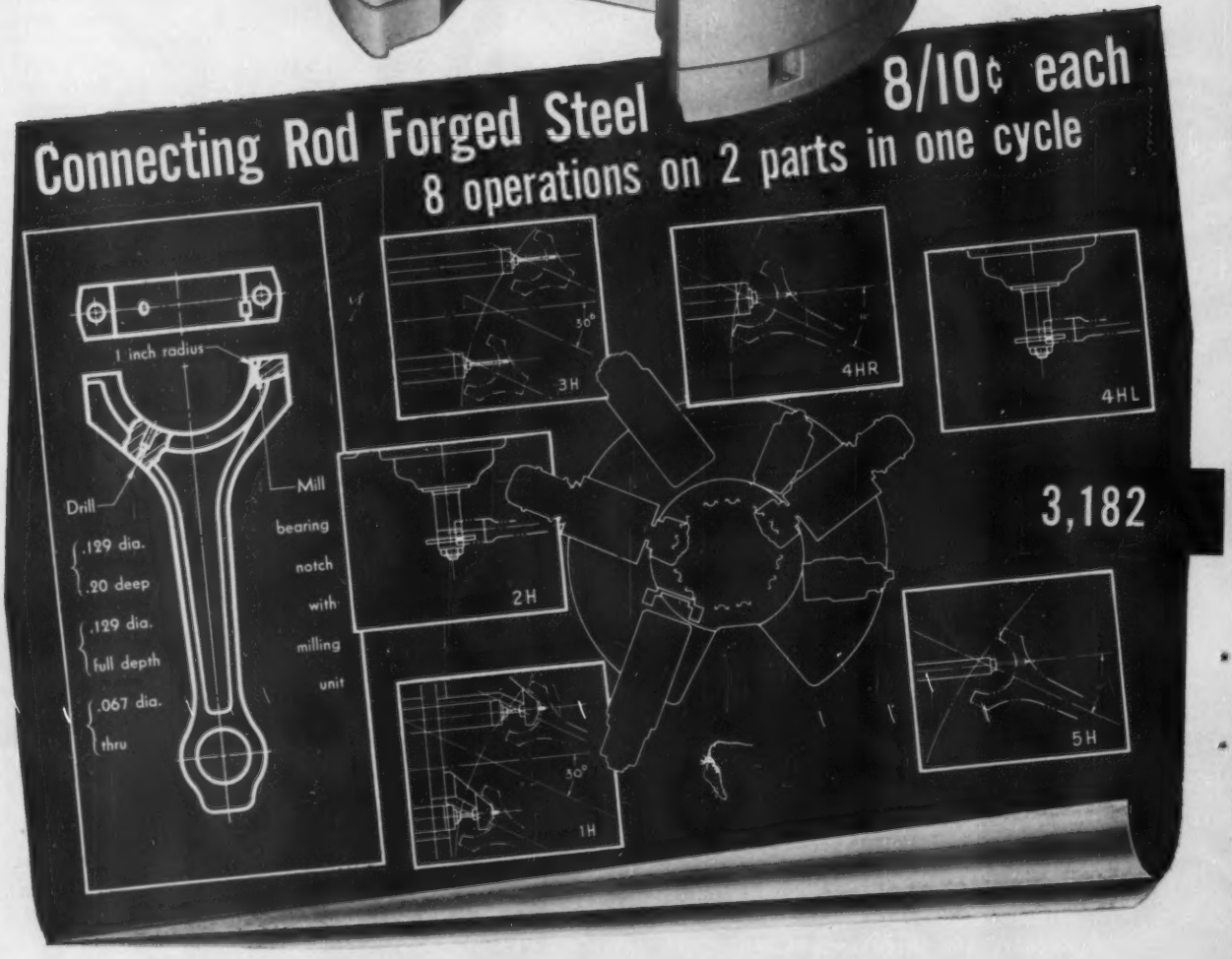
FOR MORE INFORMATION . . .

contact your Ex-Cell-O representative or write Ex-Cell-O in Detroit for literature.

"Operations Kingsbury" . . . required accuracy, low cost, high .

Connecting Rod Forged Steel 8/10¢ each

8 operations on 2 parts in one cycle



production for interchangeability

Here are two Kingsburys, custom-built to serve in widely separated product fields. Each justifies its investment. One drills a small hole and mills a notch in a forged steel connecting rod. The other works on a cast aluminum sole plate for a steam iron: drills 26 holes and spot-faces a boss.

Could this work be done on single-operation machines? "Yes." But could the connecting rods be machined for eight-tenths of a cent each? And the sole plates for one-and-one-fifth cents each?

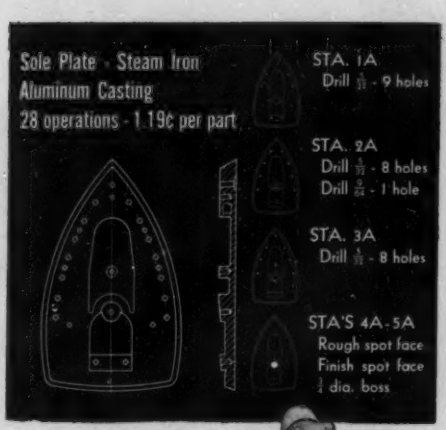
Kingsburys have so many advantages. For example: One work fixture positions the part for each successive operation. Standard units perform the operations within a pre-determined time cycle to obtain the best output with required accuracy. Tolerances are held to specifications. Scrap loss is reduced to a minimum. Floor space is saved. Handling is reduced. One operator loads and unloads the machine. And your parts will be interchangeable, reducing your assembly time.

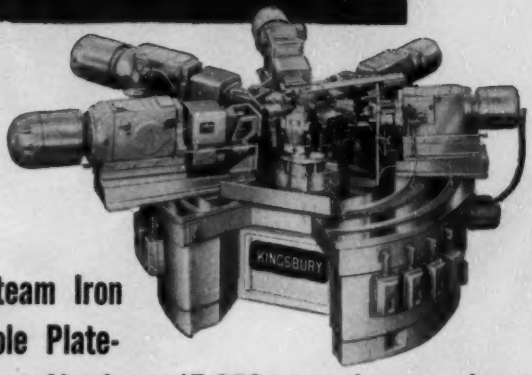
You can drill, spot drill, flat-bottom, ream, burr-ream, counterbore, countersink, mill, end-mill, hollow-mill, tap, thread, face, spot-face, form, recess, saw, trepan . . . all within certain limitations. For instance: Your product must be such that it can be machined within the limits of 5 HP units, and of a size and/or weight that can be handled efficiently by an operator.

We have some interesting bulletins we shall be glad to send you. Perhaps you manufacture a part where a few cents saved would put you in a better profit position and pay for the cost of a Kingsbury. Let's talk it over.

Kingsbury Machine Tool Corp.
107 Laurel Street, Keene, N. H.

KINGSBURY
AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production





Steam Iron Sole Plate- Cast Aluminum 17,920 operations per hour

Here's a case where a Kingsbury really "gangs up" to get the work out! The part is a cast aluminum sole plate for a steam iron; 26 angular holes to be drilled and one boss to be spot-faced.

The machine has an 80-inch base and a 20½-inch diameter index table with 7 fixtures. Five drilling units are mounted on the base. Two of these have 9 spindles each, one has 8 spindles and two have single spindle heads to perform the rough and finish spot-facing operations on one ¾-inch boss. Bushings guide all tools.

The table indexes through five working stations. At Station 6, work is unclamped automatically and removed by the operator. At Station 7, the operator places new work in the fixture, where it is clamped automatically.

Operations per hour on two forged steel connecting rods

The problems: to drill a concentric step-down hole thru, at an angle of 30°, in each of two connecting rods; also to mill a notch in each rod for the bearing.

To obtain high production at low cost per part, the machine was designed to handle *two* parts in each work-holding fixture. Six Horizontal (H) Units are mounted radially on an 80-inch base. The 26-inch index table has six of these "twin" work-holding fixtures, automatically clamped and unclamped. The machine indexes through five work stations where eight operations are performed. The longer holes are drilled in two operations to maintain a balanced time cycle at each station. Bushings guide all drills.

Station 1, Unit 1 H has two-spindle head and drills one .129 dia. hole at an angle of 30° in each rod to half the required depth.

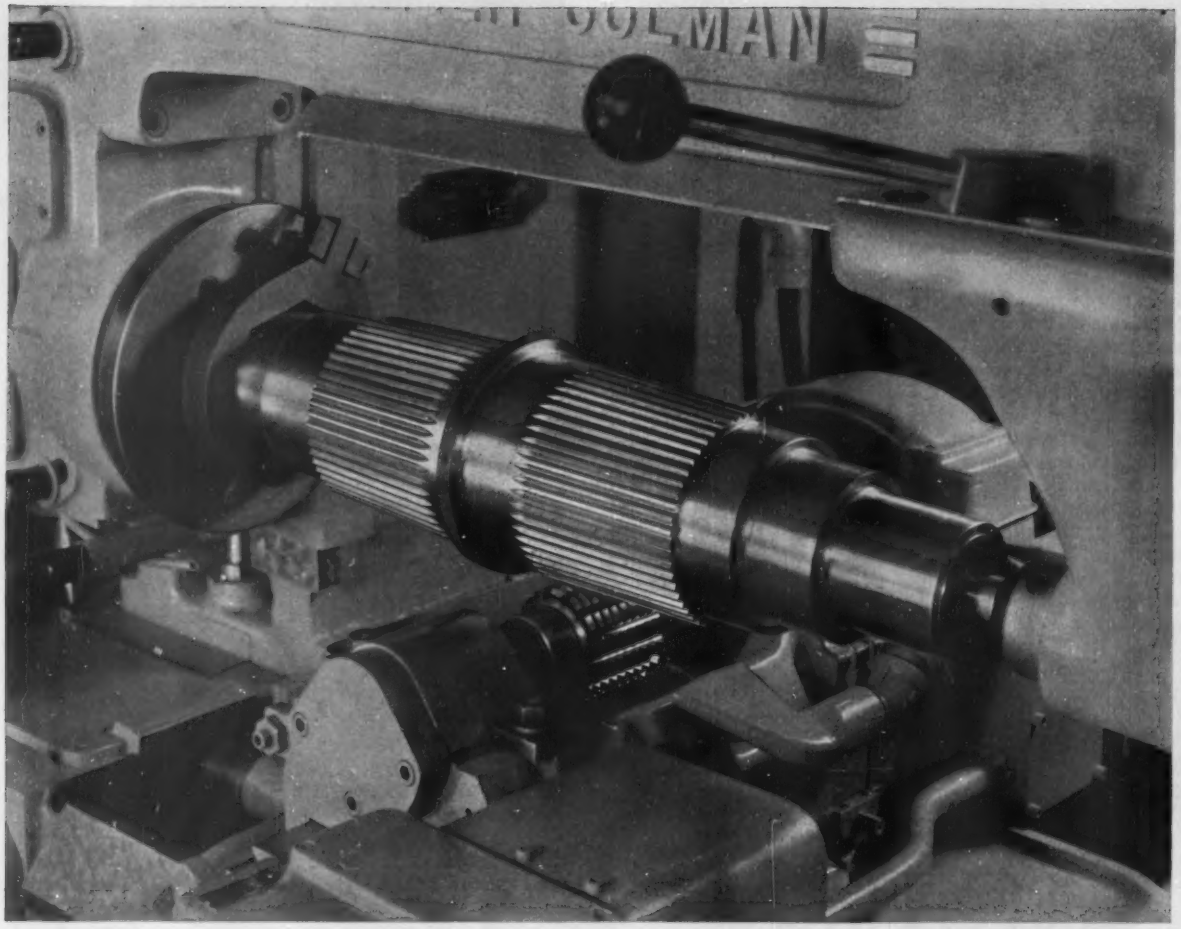
Station 2, Unit 2 H with milling unit mills the notch in the *right* hand part.

Station 3, Unit 3 H has two-spindle head and completes the drilling of the .129 hole in each rod.

Station 4, Unit 4 HR is a single spindle unit with sensitive feed; drills .067 hole thru from bottom of .129 hole in *right* hand part. *Unit 4 HL* with milling unit mills the notch in the *left* hand part.

Station 5, Unit 5 H is a duplicate of Unit 4 HR: drills .067 hole thru from bottom of .129 hole in *left* hand part.

Station 6: operator removes the two finished parts and replaces them with two new parts. Parts are unclamped and clamped automatically in the work fixture.



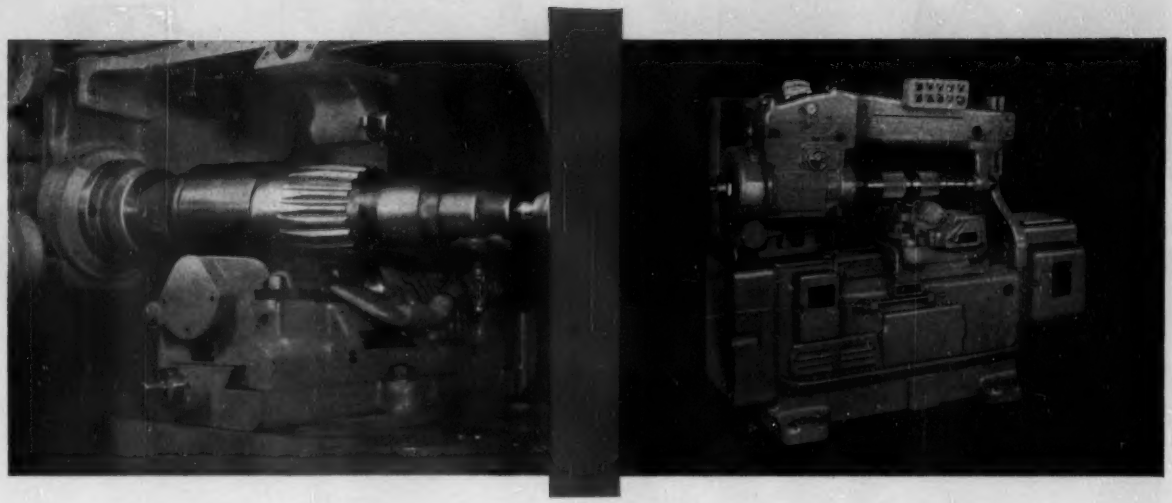
HEAVY TORSIONAL DRIVE USES TAPERED SERRATIONS
Hobbed On Specially Arranged Machines

work slide and overarm swivel up to 5°

This Barber-Colman No. 16-16 Hobbing Machine is specially designed and arranged for hobbing tapered serrations. By swivelling the work slide up to 5° to obtain the desired cutting angle, several different tapers may be hobbed on the same machine. Once the proper set-up has been made, hobbing of tapered serrations proceeds according to standard hobbing technique.

Other than the special swivel arrangement on the work slide, universal joint on the worm shaft, and a cut-away outboard overarm support, this machine is of standard design and illustrates the practicability of adapting special work to standard hobbing techniques.

When not in use hobbing tapered serrations, this machine can be used for standard spur or helical gear work and straight splines. It is equipped with an Automatic Hob Shifter for maximum hob life.



metal-to-metal fit, wear compensation

Tapered serrations provide one of the best holding means for drives which have heavy and frequently-reversing torsional loads. The metal-to-metal side bearing fit eliminates relative rotation between members, and the taper provides for take-up to compensate for wear. Typical applications are heavy reversible drives such as tractor axles and hubs, and high-frequency reversible drives such as steering shafts and Pitman arms.

involute tapered serrations

Both involute and straight-sided tapered serrations may be produced by this hobbing method. The major illustration shows the hobbing of 10/20 diametral pitch involute serrations, ¾" taper per foot O.D., 54 teeth, and 6" major diameter. These teeth have a generated form with tapered root and outside diameter, the form changing continuously from the large to the small end. The mating part is swaged slightly undersize and the desired contact is obtained as a result of cold working the material in fitting the members. The swage is usually hobbed by the same set-up as the tapered shaft.

straight-sided tapered serrations

The second illustration shows the hobbing of straight-sided serrations using a single-position hob. These teeth are hobbed in 2-cuts and have straight sides with constant-width tooth spaces which permits the mating part to be broached to size after reaming to the correct taper. The internal mating part is broached one tooth at a time, providing a metal-to-metal fit which is not dependent upon cold working the material. Should looseness occur due to wear, it is taken-up on the tapered sides of the teeth.

Barber-Colman Engineers developed the special single-position hob for producing tapered serrations with a constant space width. They welcome special applications where this type of drive is an advantage and will be glad to furnish estimates on both hobs and machines for economically producing tapered serrations. Just send prints or samples marked for the attention of our Hob Engineers.

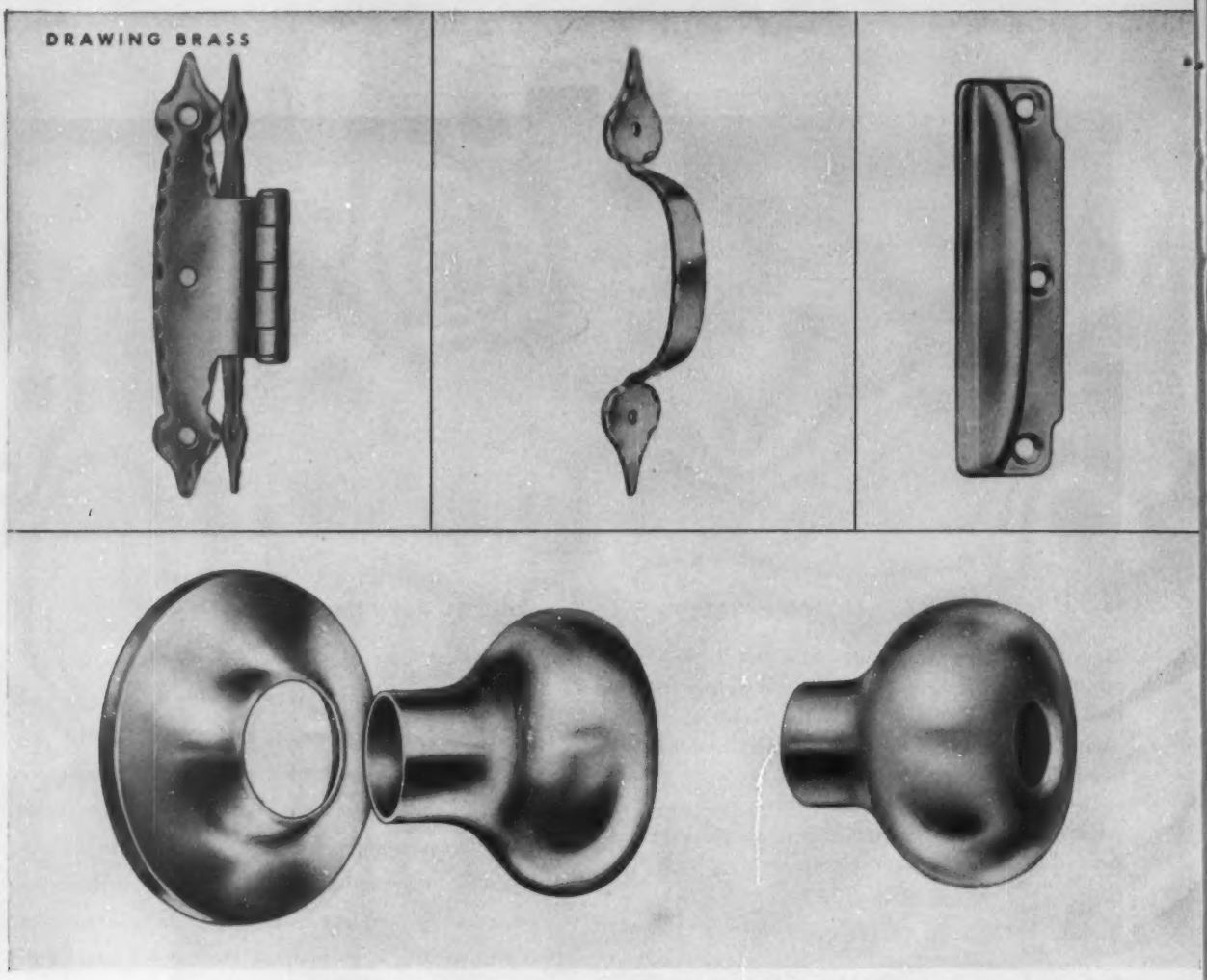
HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 616 ROCK STREET, ROCKFORD, ILLINOIS

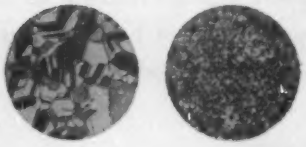
HOBS AND MACHINES SINCE 1911



THESE HARDWARE ITEMS are made by Adams Rite Mfg. Co., Glendale, Cal., and National Lock Co. and American Cabinet Hardware Co., both of Rockford, Ill. They are typical of the stamped, drawn and pressed products

Formbrite—Anaconda's new drawing brass—polishes up to

Superfine grain makes Formbrite harder, stronger, springier and more scratch-resistant



75X magnification of ordinary drawing brass. 75X magnification of superfine-grain Formbrite.

Here is what enthusiastic manufacturers of stamped and drawn brass products say about *Formbrite:*

". . . cuts our polishing costs up to 50% . . . eliminates some finishing operations entirely . . . gives amazingly sharp die impressions...resists scratching in handling . . . plates beautifully . . . gives a more lustrous finish . . ."

Yet *Formbrite** costs no more than the ordinary drawing brasses these manufacturers had been using. In fact, Formbrite very often saves more than the metal itself costs.

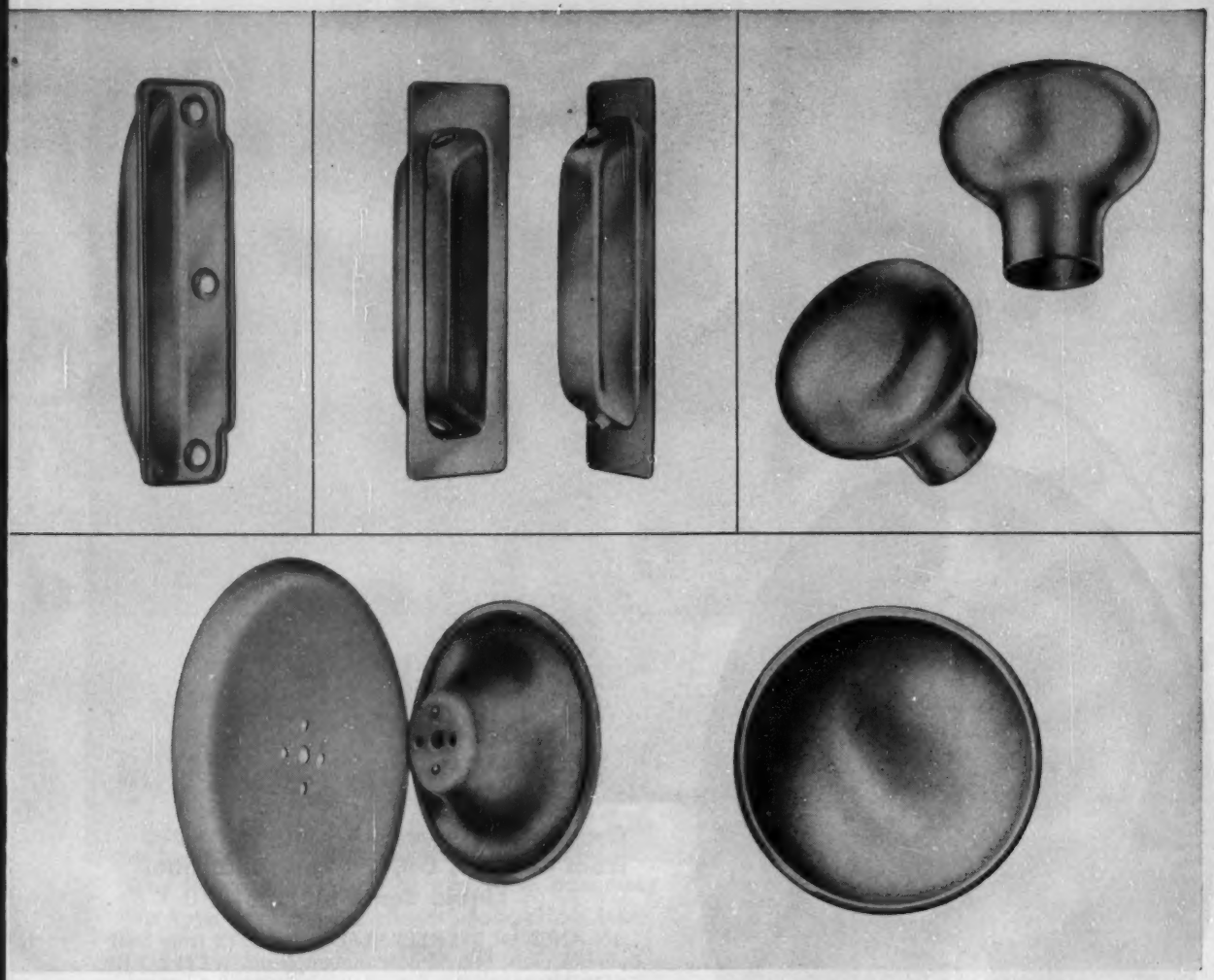
Why Formbrite is easier to use

Note Formbrite's superfine grain structure. Compare it with that of ordinary drawing brass. Special methods of rolling and annealing produce a grain structure so fine that often a simple color buff will bring it to a bright, lustrous finish.

Formbrite is also harder, stiffer, springier and more scratch-resistant . . . yet it is surprisingly ductile, readily stamped, formed, drawn and embossed.

Typical case

The Adams Rite Mfg. Co. makes the flush pull shown in the upper right



successfully made of Formbrite. Others include: lipstick holders, fishing lures, automobile hubcaps, gage cases, trophy nameplates, pen caps, etc. (Doorknob parts in lower left illustration have been chromium plated.)

50% faster... costs no more than ordinary drawing brass

illustration above. For this and many other building hardware items, they use Formbrite. They report:

"Formbrite increases surface hardness and rigidity of the part . . .eliminates several polishing operations and reduces over-all costs. Our flush pull definitely has been improved in quality."

Free sample

Formbrite is available in sheet, strip and coils—in all commercial widths and gages. Millions of pounds of this superior drawing brass have been made, sold and satisfactorily fabricated.

Want more proof? Mail the coupon and we'll send you a sample of Formbrite. Try it in your polishing room. See for yourself how quickly and easily Formbrite polishes. 8488

*Reg. U. S. Pat. Off.

Formbrite

FINE-GRAIN DRAWING BRASS

AN ANACONDA® PRODUCT

MADE BY THE AMERICAN BRASS COMPANY

FREE SAMPLE—Test Formbrite Yourself

The American Brass Company, Waterbury 20, Connecticut

(In Canada: Anaconda American Brass Ltd., New Toronto, Ont.)

☐ Send me a free sample of Formbrite to try in my polishing room.

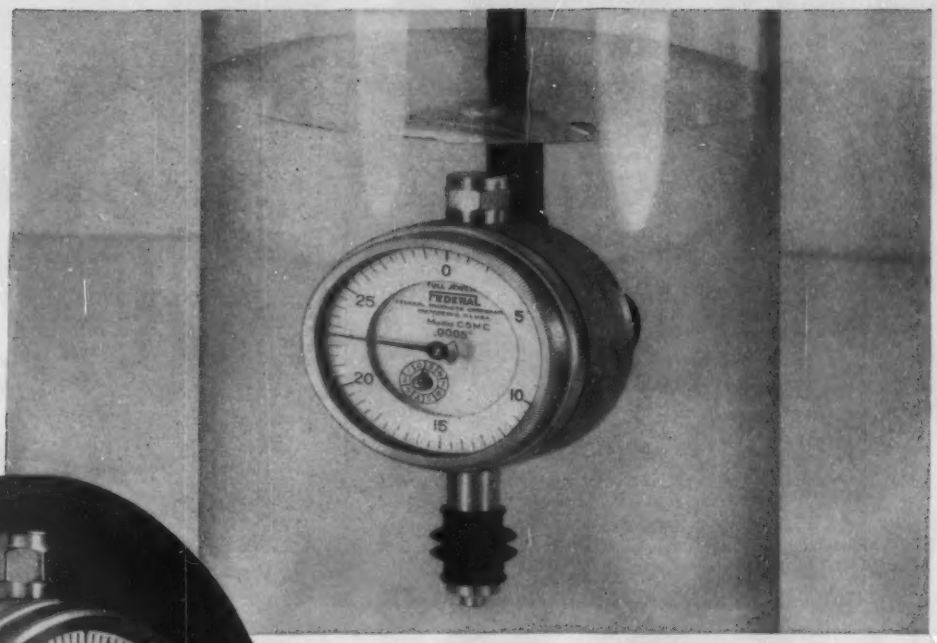
☐ Send me Publication B-39, giving forming and finishing suggestions.

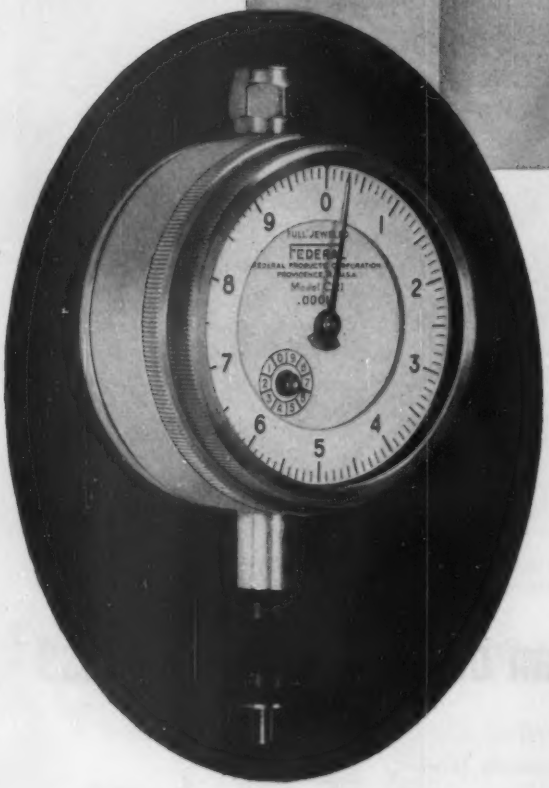
NAME.....

COMPANY.....

STREET.....

CITY.....ZONE.....STATE.....





You can splash, dunk, or spray this Wetproof Dial Indicator. It will give excellent performance and greatly cut maintenance costs.

AND NOW!
A WETPROOF DIAL INDICATOR

Completely Sealed—Wholly Protected from Coolant, Oil, Oil Fog, and other Liquid Contaminants

IN ANSWER TO REPEATED REQUESTS from Dial Indicator users, Federal now announces this WETPROOF DIAL INDICATOR which eliminates maintenance troubles commonly encountered under adverse operating conditions. "W" Series Dial Indicators are completely wetproofed and built unusually rugged to withstand heavy handling. The internal mechanism is protected by tightly sealed external openings. THE CRYSTAL IS OF GLARE-PROOF GLASS remarkably free of halations. It will not discolor when exposed to oil or staining liquids. A heavy duty case and four oversize back screws make these exceptionally durable Indicators. They are regularly furnished with revolution counter and Cushion Movement. The dial rotates for zero (0) setting. Available in "C" size (2¼" O.D.) and made to AGD specifications (except for minor variations). TRY THIS NEW INDICATOR ON YOUR TOUGHEST JOBS. Write

FEDERAL PRODUCTS CORPORATION
4128 Eddy St., Providence 1, Rhode Island

Ask FEDERAL

FOR ANYTHING IN MODERN GAGES...

Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting or Automatically Controlling Dimensions on Machines

The new Air Bore Gage brings to small run jobs the basic advantages of the Dimensionair's stable accuracy, precisely calibrated scale, fast set-up, and long range.

THESE ARE NEW

Adjustable AIR BORE GAGES

Get the advantages of extreme accuracy at low cost on smallest production runs

A MAJOR ADVANCEMENT IN AIR GAGING, Federal's Adjustable Air Bore Gages bring the sensitive accuracy and high magnification of the DIMENSIONAIR measuring system to job or to production runs. FOUR GAGES COVER A MEASURING RANGE FROM ½" TO 8". Their light weight makes them very easy to handle. Particularly in the larger sizes and where holes with large diameters are difficult to reach, these light weight gages provide a convenient, non-fatiguing method of checking holes with air.

Since the centralizing contacts are concentric with the axis of the gaging contacts, the gages can be set with gage blocks and measurements transferred to a hole with no significant error. Repetitive accuracy is outstanding. Learn more about this latest development in air gaging. Write

FEDERAL PRODUCTS CORPORATION
4128 Eddy St., Providence 1, Rhode Island

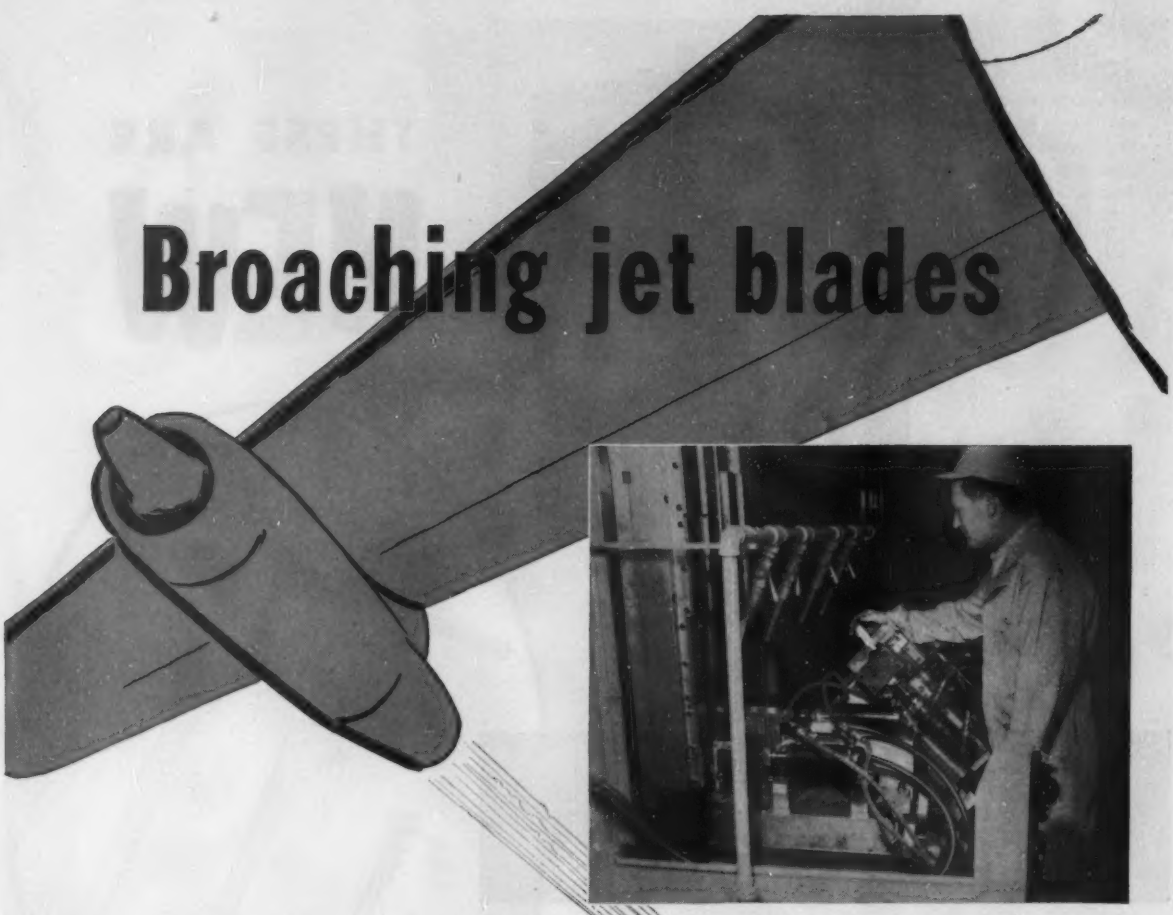
All models of Adjustable Air Bore Gages are regularly furnished with Tungsten carbide gaging contacts. These gages can be used with either the 2500 TO 1 MAGNIFICATION or 5000 TO 1 MAGNIFICATION Dimensionairs, including those now in use throughout industry.

Ask **FEDERAL**

FOR ANYTHING IN MODERN GAGES...

Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting or Automatically Controlling Dimensions on Machines

Broaching jet blades



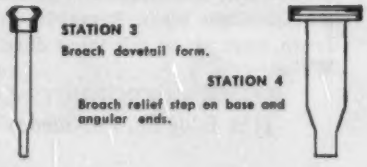
American Dual Ram Surface Broaching Machine performs 4 operations on stainless steel blades

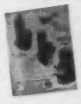
To broach stainless steel jet compressor blades, American installed standard vertical hydraulic dual-ram surface broaching machines with tilting work tables. Each machine was arranged with 4 broaching stations, two at each ram. One of each of the operations shown are performed at each of the 4 stations. The parts are automatically clamped and unclamped with the operator loading the stations at one ram while the other is broaching.

For answers to your broaching problems write to American — the company that makes all three — machines, fixtures and broaches.

STATION 1
Broach base ends, platform, underside of platform, radii and blending edge of airfoil.
STATION 2
Broach leading and trailing edge of airfoil.

HERE ARE THE FOUR JET BLADE SURFACES BROACHED





Catalog #300 illustrates and describes American surface broaching machines. Send for a copy for your files.

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

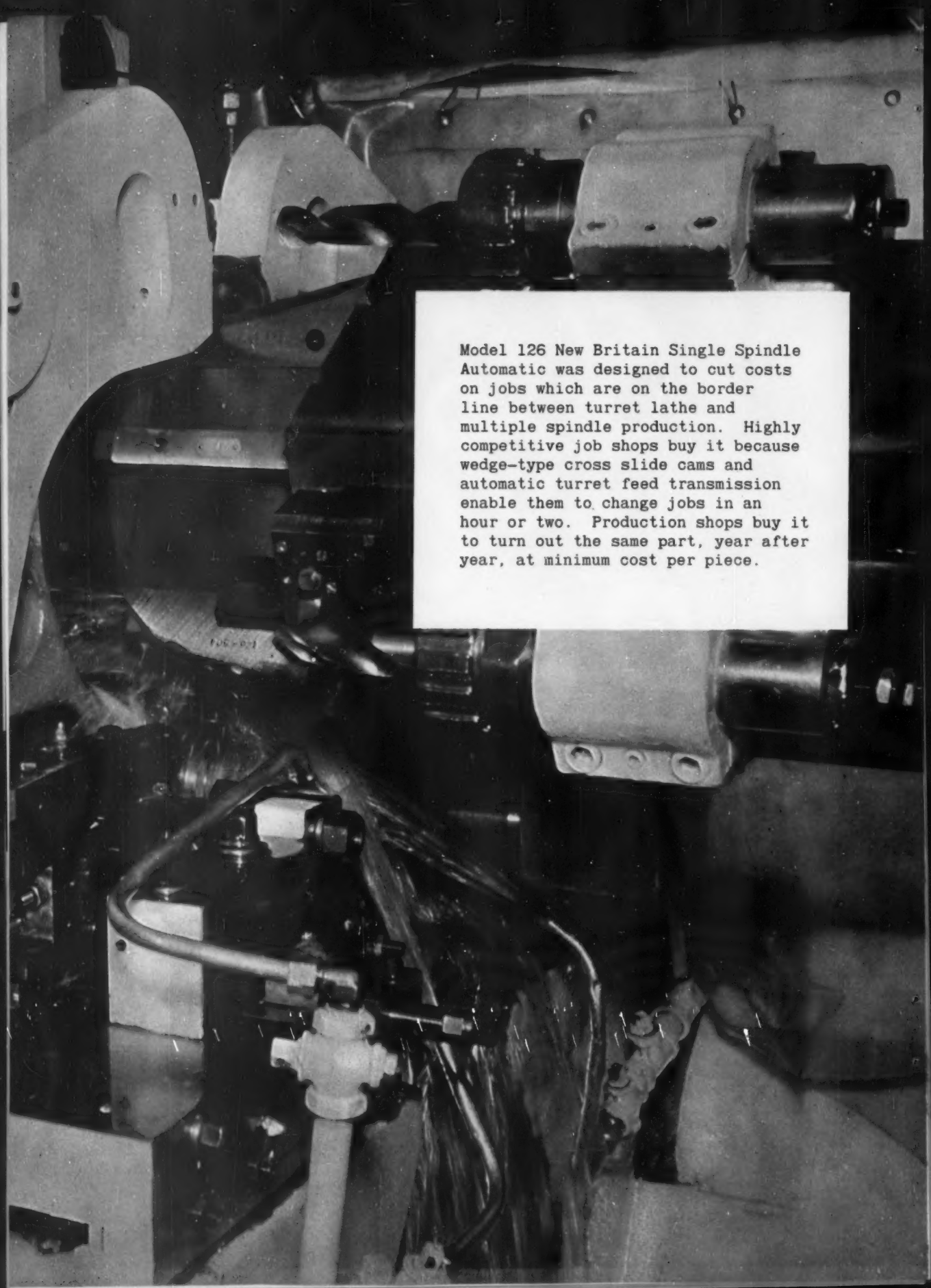
See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

SUNDSTRAND

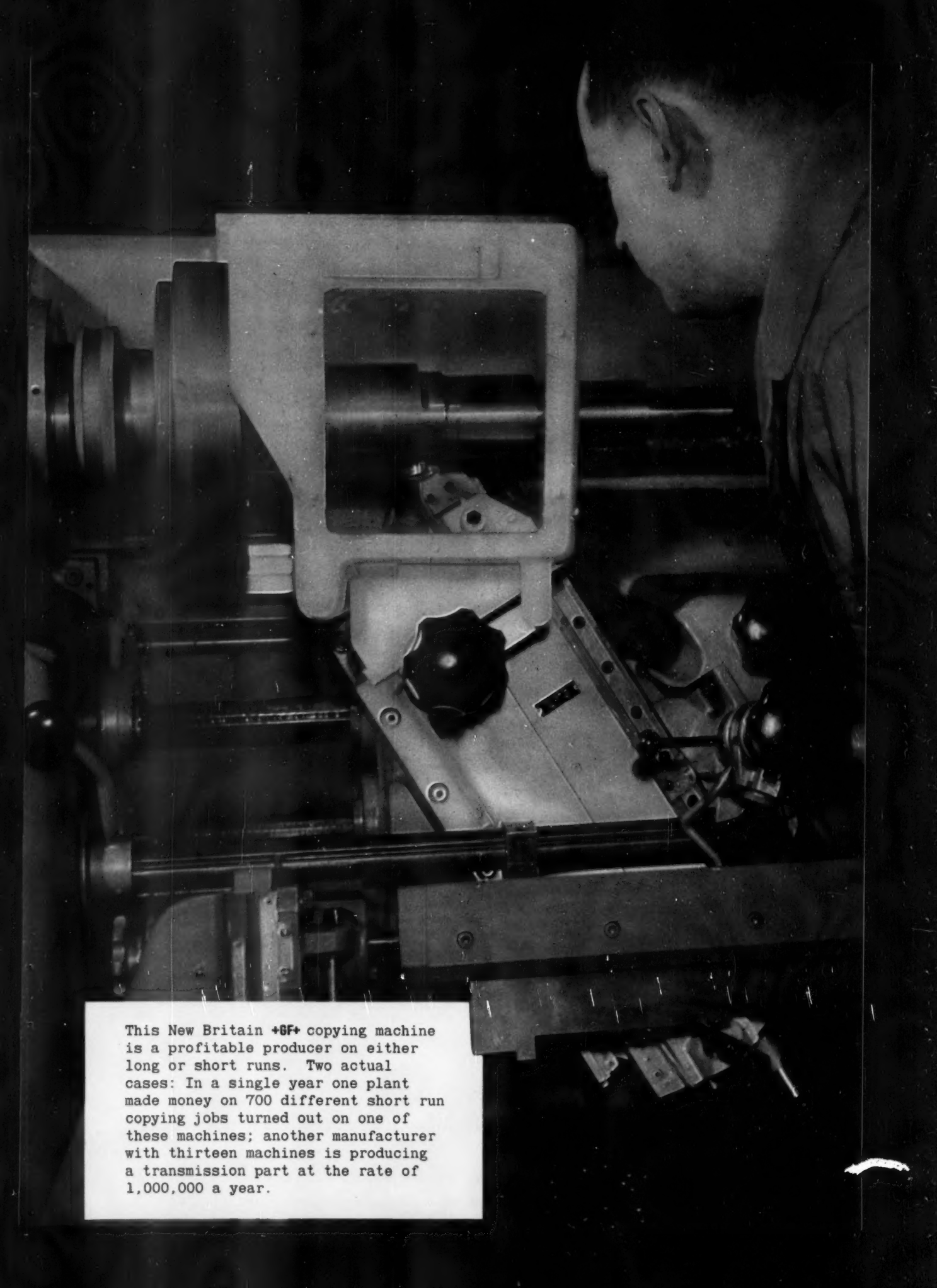
This record-breaking high production brass job can only be produced economically on a rugged automatic running at high spindle speeds. Such a combination is not only necessary for brass and aluminum but equally important for carbide tools. New Britain Model 601 was specifically designed to profitably handle such long runs of complex pieces at high speeds. However, it also has set-up features which cut down-time to a minimum on short run jobs where quick changeover is a must. For machines principally designed for shops where the chief emphasis is on close bid short run work, see the two following pages.

THE NEW BRITAIN MACHINE CO.

NB



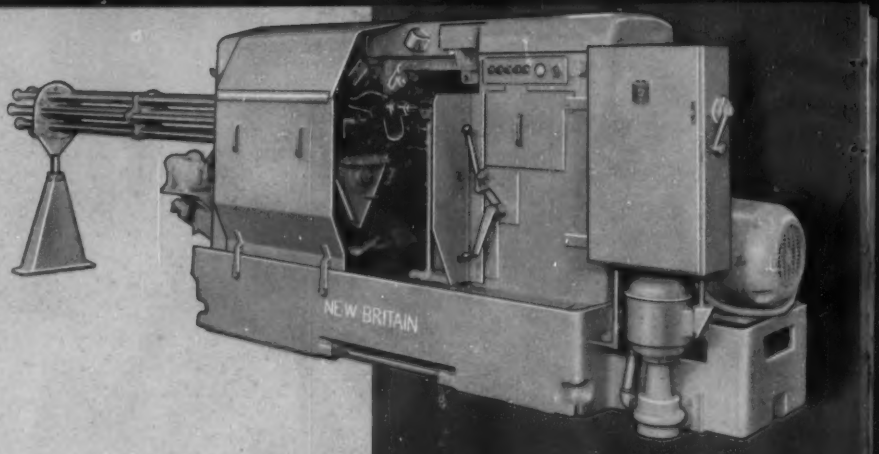
Model 126 New Britain Single Spindle Automatic was designed to cut costs on jobs which are on the border line between turret lathe and multiple spindle production. Highly competitive job shops buy it because wedge-type cross slide cams and automatic turret feed transmission enable them to change jobs in an hour or two. Production shops buy it to turn out the same part, year after year, at minimum cost per piece.



This New Britain +GF+ copying machine is a profitable producer on either long or short runs. Two actual cases: In a single year one plant made money on 700 different short run copying jobs turned out on one of these machines; another manufacturer with thirteen machines is producing a transmission part at the rate of 1,000,000 a year.

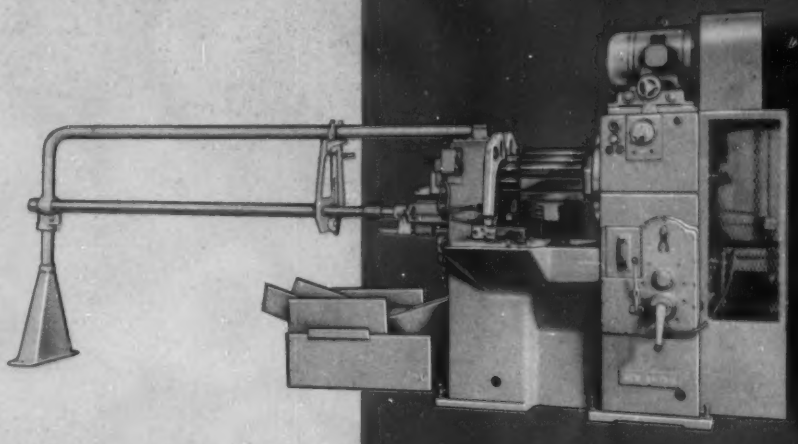
MODEL 601

Six Spindle Automatic Bar Machine, 1¼" capacity. Massive, powered for tough forming steel jobs, and with super high spindle speeds for non-ferrous metals. Cross slides in each position are actuated by small disc type cams mounted directly behind the side.



MODEL 126

Single Spindle Automatic. Capacity 2⅝" x 6". No cam changes for main turret feeds • No pick-off gears to change in selecting speeds and feeds • Quickly adjustable standard wedge cams for cross slide feeds • Automatic cycle completely controlled from central drum • Pre-selected, automatically changed feeds for each of five turret stations.



NEW BRITAIN +GF+

Copy Turning Machine eliminates the conventional lathe bed. Chips fall free and accumulate through the back of the machine. Copying carriage is mounted below the spindle. Every control is at the operator's finger tips, and template or prototype is also on the front of the machine. Self-contained pumping unit in carriage eliminates the nuisance of flexible hose. Powerful drive and a wide range of speeds and feeds make it a profitable producer on runs of any length.

Our general catalog is filed in the Sweet's Machine Tool Catalog File.

AUTOMATIC BAR and CHUCKING MACHINES • PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES
NEW BRITAIN +GF+ COPYING LATHES

The NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut

Before You Buy any Air-Gage

you should know these 4 facts about a T-P CompAIRator

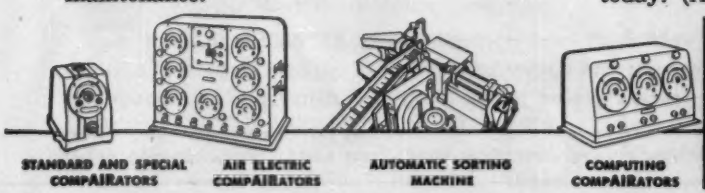
1. It's Faster! There's no flutter nor falling off of the pointer. No guesswork required. Readings are virtually instantaneous *even when long extension hoses are used.*

2. More Versatile! No other air gage matches the instant accuracy of this velocity-type circuit for such a wide variety of applications — from simple internal diameters to simultaneous checks of concentricities, squareness, center distance, etc. — bellmouth or barrel shapes.

3. It Costs Less to Operate! Vibration, hard knocks, jarring — even tilting — do not disturb the accuracy of a T-P CompAIRator. Its rugged construction eliminates expensive maintenance.

4. It Has A Wider Range! A T-P CompAIRator can be simply, quickly applied to check any dimensional relationship — even down to internal diameters as small as .055" . . . tolerances from .0001" to .120". No other air gage approaches this range. It means wider application, greater usefulness, more gaging for your money.

Before you buy any air gage you'll want to talk over these advantages with a Taft-Peirce sales engineer. Discover the dollars and sense savings a T-P CompAIRator can make for you. Write today. (And ask for descriptive Handbook.)

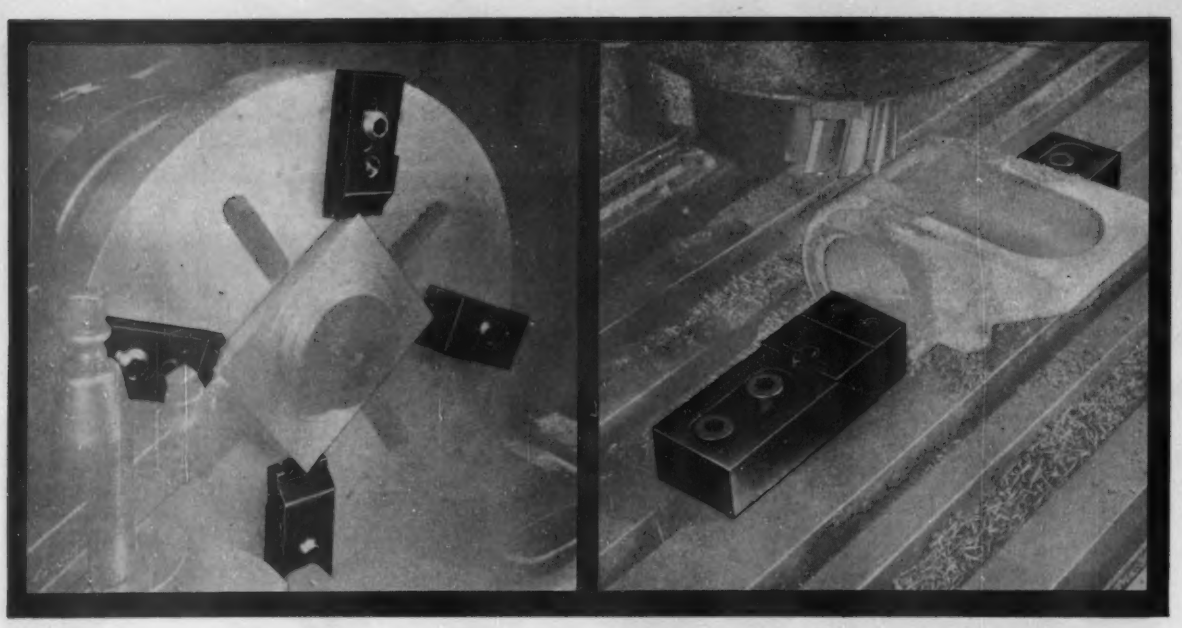


STANDARD AND SPECIAL COMPAIRATORS | AIR ELECTRIC COMPAIRATORS | AUTOMATIC SORTING MACHINE | COMPUTING COMPAIRATORS

T-P means Top Precision

T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND



J & S "ALL-PURPOSE" JAW CLAMPS CAN BE USED ON ALL STANDARD TYPES OF MILLING MACHINES, LATHES, PLANERS, BORING MILLERS, DRILL PRESSES, AND OTHER MACHINE TOOLS

How to secure workpieces with ease, cut handling time up to 75%

J & S "All-Purpose" Jaw Clamps give you many unusual advantages in securing workpieces to machine tools—save as much as 75% of the time required with outdated methods

Downholding Principle

J & S' *downholding* principle makes this possible Here's how it works When you turn the adjusting screw of the clamp, the jaw travels straight *in* and *down* This forces the workpiece horizontally against the opposite clamp and downward against the face plate or table In this way, centering is quick, simple The tapered slot prevents the clamp from slipping regardless of the load

Need no U-clamps or straps

With J & S "All-Purpose" Jaw Clamps, you can avoid the use of U-clamps and straps, disregard different length studs and blocking. You can also minimize obstructions in set-ups, reduce cut-off waste You can pass over J & S Jaw Clamps 1" from the working surface of the machine face The whole surface of the workpiece can be machined to within ⅜" of the face plate or table.

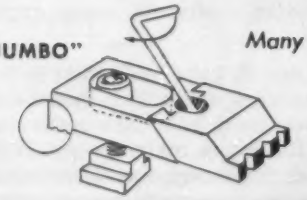
You can get J & S "All-Purpose" Jaw Clamps in a variety of sizes Write for complete information today

J & S "JUMBO" and "LI'L GIANT" JAW CLAMPS

For large planers

Many times more powerful than finger set-ups

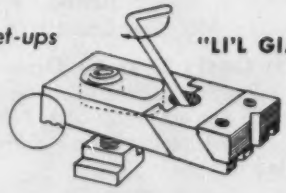
"JUMBO"



FORM RELIEVED

COMPLETELY HARDENED

"LI'L GIANT"



Both clamps have T-nuts which fit all large standard planers. 45° oblique travel of jaw secures workpiece against table and against counterthrust of opposite clamp. 1/16" back taper (dotted line) and relieved ground surface (magnified detail) prevent slippage.

J&S TOOL CO., INC.

WHEEL DRESSERS • JAW CLAMPS • PRECISION VISES • SINE BARS DOWN-HOLDING DEVICES

646 W. Mt. Pleasant Ave., Livingston, New Jersey

The Right Answer

TO YOUR MOTOR CONTROL "Housing" PROBLEMS

ARROW·HART

INDUSTRIAL-USE Enclosures

(NEMA TYPE XII)

NEMA SIZE 3 ILLUSTRATED

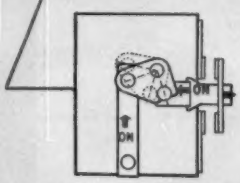
Developing this new line of NEMA XII Enclosures, Arrow-Hart worked in close cooperation with leading Industrial Engineers throughout the country. Their recommendations have helped us make these the finest enclosures ever offered for use in those industries where it is desired to exclude such materials as dust, lint, fibres and filings, or oil and coolant seepage. Teamed with Arrow-Hart Type "RA" Magnetic Motor Starters, they assure the superior electrical performance that will help all machines realize their full productive efficiency.

Features . . .

- BALLOON TYPE IMPRESSION GASKET . . . of heavy neoprene effectively seals out oil.
- RUGGED CONSTRUCTION . . . of heavy, seamless drawn steel. Hinged cover is more convenient, can't be dropped, provides superior alignment with even pressure all around for a complete seal.
- AUTOMATIC LATCHES . . . hold cover securely even if locking screws are accidentally left loose.
- NO KNOCKOUTS . . . with no possibility of accidental removal or loosening of unused knockouts . . . and, thereby, no possibility of admitting breakdown materials. Plenty of room in enclosure makes it easy to drill for top or bottom entrance.
- REMOVABLE MOUNTING PLATE . . . makes it easy to remove starter from enclosure by merely loosening 2 non-removable screws.

Available . . . IN NEMA XII

- ACROSS-THE-LINE SIZES 0, 1, 2 and 3
- REVERSING AND TWO-SPEED SIZES 0, 1 and 2
- COMBINATION STARTERS . . . SIZES 0, 1 and 2



with EXCLUSIVE ARROW-HART "RIGHT ANGLE" DESIGN STARTERS

Arrow-Hart Type "RA" Starters feature a completely new, radically different operating mechanism. Working through a bellcrank lever linkage, the much smaller magnet gains added leverage and easily outperforms old-fashioned, direct-acting types. Here are some of the important benefits made possible by this first real advance in motor control design in over 25 years . . .

- GREATLY REDUCED SIZE AND WEIGHT
- IMPROVED PERFORMANCE AND DEPENDABILITY
- STRAIGHT-THRU FRONT WIRING
- ALL CONTACTS EASILY ACCESSIBLE FROM THE FRONT
- POSITIVE UNDERVOLTAGE RELEASE
- SUPERIOR ARC SUPPRESSION

SEND FOR COMPLETE INFORMATION . . . MAIL THIS COUPON TODAY

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INDUSTRIAL CONTROL DIVISION
103 HAWTHORN ST., HARTFORD 6, CONN., U.S.A.

Offices, sales engineers and warehouses in: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco. In Canada: Arrow-Hart & Hegeman (Canada) Ltd., Mt. Dennis, Toronto. In England: Arrow Electric Switches, Ltd., Ealing, London W5.

Quality MOTOR CONTROLS • WIRING DEVICES ENCLOSED SWITCHES • APPLIANCE SWITCHES

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THE ARROW-HART & HEGEMAN ELECTRIC CO.
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Please send my free copy of Circular No. MC-T1-76.

NAME _____
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COMPANY _____
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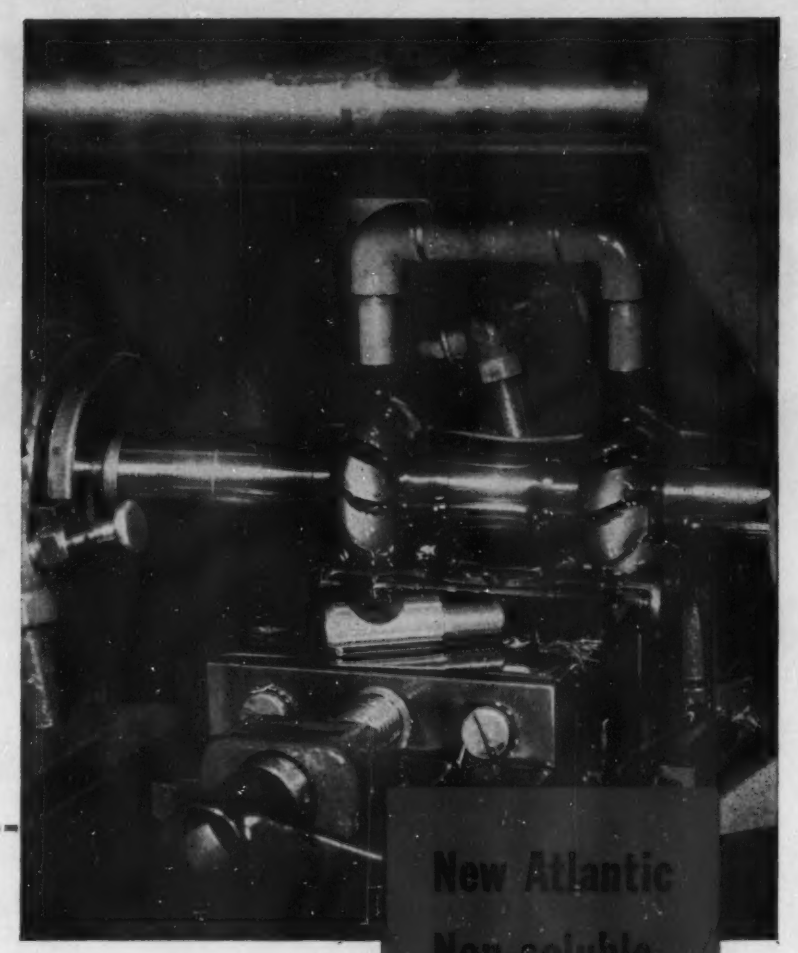
CITY _____ ZONE _____ STATE _____
AM-9

Try them on your tough jobs first



The toughest job in the shop is the real test for cutting oils. And we want you to know how good these Atlantic Cutting Oils are.

So try them on your tough jobs: deep hole drilling, threading, difficult milling. You'll notice results that you perhaps never had before: Long tool life, superior finish, cool work, freedom from foul odors, ability to see the work right through the oil. These oils are compatible when blended even down to the heaviest grades.

Your operators will like these new oils, too. Because they don't indelibly stain hands or clothing. They mean a cleaner shop—something everybody will appreciate.

Atlantic engineers have prepared a valuable new Cutting Oil Selection Chart. It shows how to select the proper cutting oil based on cutting oil efficiency rather than chemical composition. Get your copy. Write your nearby Atlantic office listed below, or The Atlantic Refining Company, 260 South Broad St., Philadelphia 1, Pa.

ATLANTIC

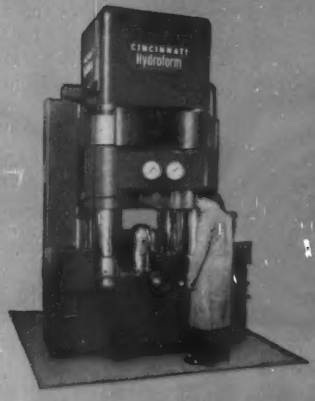
LUBRICANTS · WAXES
PROCESS PRODUCTS

PROVIDENCE, R. I., 430 Hospital Trust Bldg.
READING, PA., First and Penn Aves.
SYRACUSE, N. Y., Salina and Genesee Sts.
PITTSBURGH, PA., Chamber of Commerce Bldg.

two more examples of time and tool cost savings by Hydroforming

▲ PART A: Hydroformed in one operation from a 23″ dia. blank of 0.051″ aluminum.

PART B: Hydroformed in one operation from a 19″ dia. blank of 0.032″ aluminum. ▼



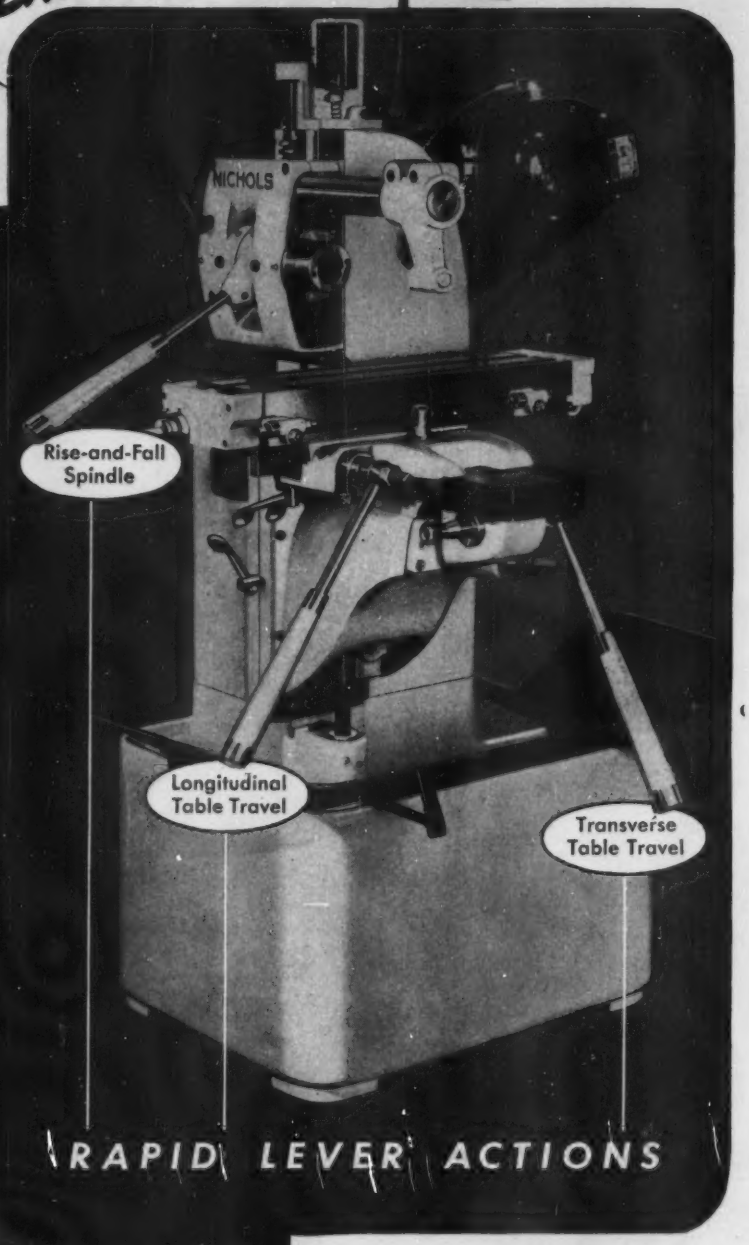
The parts illustrated represent difficult, multiple-operation draws by conventional methods, using complicated and costly tooling. However, each part was produced in *one* draw by Hydroforming. *Minimum* tool cost was incurred. Part A was produced using a *plastic* punch. Part B was drawn with a cast *aluminum* punch. Two simple steel draw rings were the only other tool elements required. In both cases, finished part samples were submitted for engineering approval after just *two hours* development time on the machine.

Similar savings can be *yours* by Hydroforming. Let a Cincinnati Milling field engineer give you complete details. For a description of the Hydroforming process and specifications of the 8″, 12″, 19″, 23″, 26″ and 32″ machine sizes, write for Bulletin M-1759-3.

CINCINNATI **Hydroform**

PROCESS MACHINERY DIVISION
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.

LATHE CARRIAGE FLEXIBILITY



Nichols Miller

PRODUCTION MODEL

Precision turning, boring and recessing jobs that are normally assigned to toolmaker's lathes or expensive boring machines, come natural to the versatile NICHOLS Millers.

Rapid Lever Actions on the Spindle Head, Table, and Saddle provide unparalleled flexibility of movements. The Lever Transverse Feed, an exclusive NICHOLS development, is especially valuable. Makes NICHOLS different from other hand millers. It adds "lathe-carriage flexibility" to your most intricate machining operations, while maintaining tolerances to "tenths." Work can be chucked lathe-fashion on the spindle with tools mounted on the table or vice versa.

Adjustable positive stops, quick-acting locks on sliding movements, and the highest degree of precision are standard equipment.

"THE MILLER THAT USES ITS HEAD"

Send for free illustrated brochure.

MANUFACTURED BY W. H. NICHOLS COMPANY, WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS

NICHOLS-MORRIS CORPORATION

76-F Mamaroneck Ave., White Plains, N. Y.

CONDENSED SPECIFICATIONS

Table Working Surface	6¼" x 21"
Longitudinal Table Travel	10"
Transverse Table Travel	7"
Vertical Travel of Knee	13"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to	5000 R.P.M.
Weight	1250 lbs.

How to squeeze real savings out of your costly labor dollars—

Simplify and Save THE PURE OIL WAY!

6-WAY SAVINGS!

1. Simplifies Lubrication
2. Speeds-Up Application
3. Minimizes Mis-application
4. Cuts Down Inventories
5. Eases Stock Control
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Be *sure* with Pure—Sales offices located in more than 500 cities in Pure's marketing area.

Chances are, you can save real money on costly *man-hours* and *machine maintenance* by *simplifying* your lubrication schedule right down the line from purchasing to application.

Scientifically formulated to do many jobs equally well, Pure Oil's *money-saving lubricants* reduce inventories from many different oils and greases to a few *multi-purpose lubricants*.

Pure Oil multi-purpose lubricants not only cut down the number of lubricants but also eliminate the danger of mis-application and time-consuming identification of single purpose oils and greases.

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Please send me your free booklet on how to "Simplify and Save"

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This 108 Inch Newton Cold Saw saws these 34 inch diameter non-ferrous billets in 80 seconds!

Its 100 H.P. motor whirls 9 foot diameter saw discs up to mile-a-minute cutting speeds in non-ferrous metals!

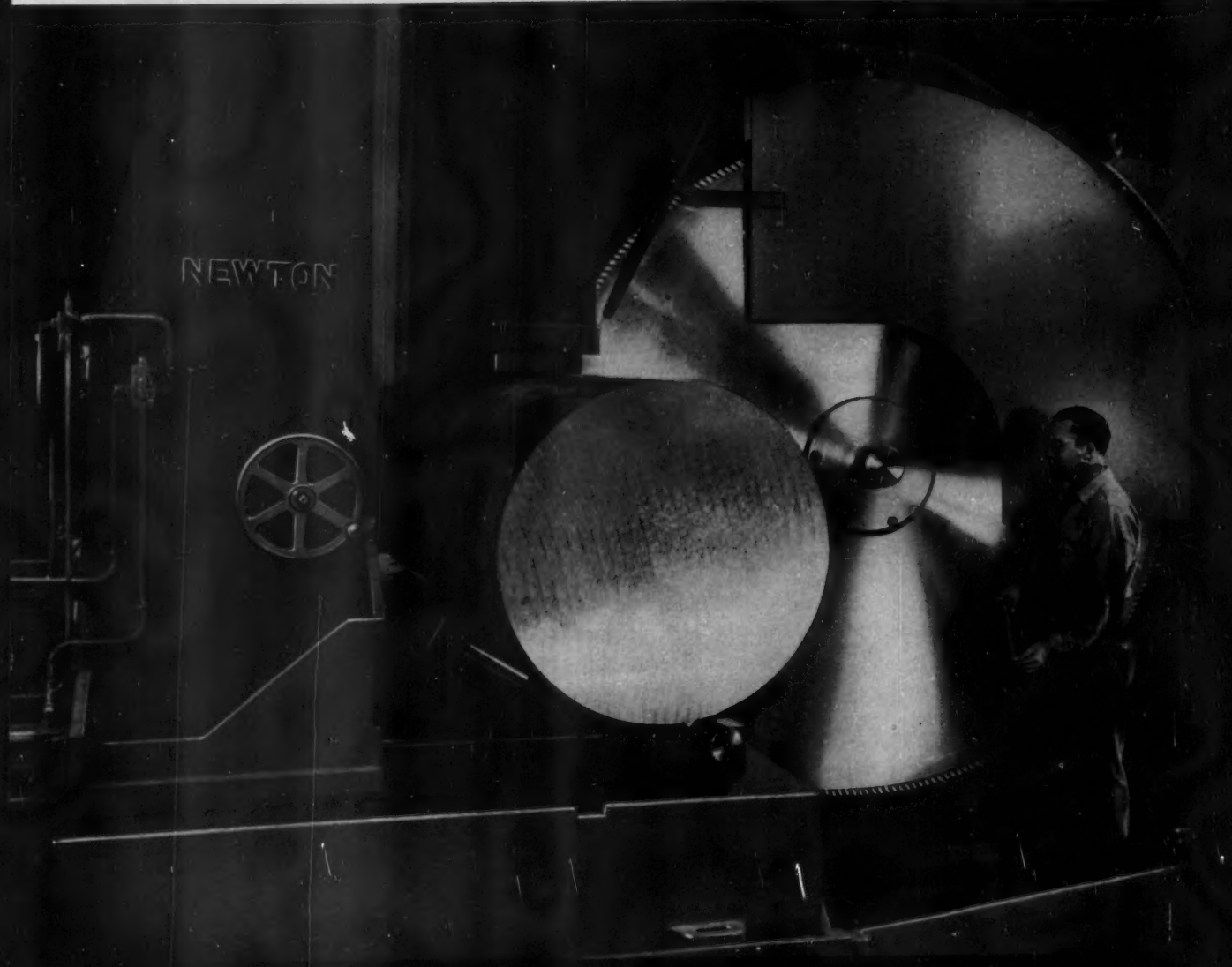
This is a big saw. It weighs 50 tons! But Consolidated also builds larger saws and smaller ones.

***Non-ferrous**

CONSOLIDATED MACHINE TOOL

Wholly owned subsidiary of Farrel-

Like Cordwood!



CORPORATION, ROCHESTER, N. Y.

Birmingham Company, Incorporated

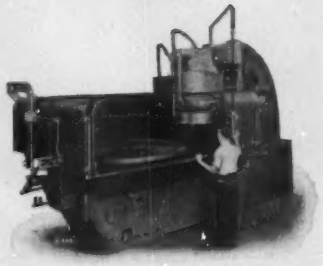
Put it on the Blanchard . . .
it takes 1/5th the time!

Here is another example of the high production attainable while grinding to extremely close tolerances with Blanchard Surface Grinders and Blanchard Wheels.

It formerly took 45 hours, floor-to-floor, to grind these nine hardened steel machine tool ways. They are 2½" x 3½" x 50" and hardened to Rockwell C-60-63.

Now, these highly desirable results are obtained, using a No. 42-72-84 Blanchard Surface Grinder — nine are placed on the chuck and ground on 6 sides, removing .015" from each surface, parallel to .001". flat within .001" with surface finish of 5 micro-inches. The Blanchard **cut time to 9 hours,** floor-to-floor!

No wonder production men say: "Put it on the Blanchard — it takes less time to do a better job".



This is the largest Blanchard Surface Grinder, No. 42-72-84.

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

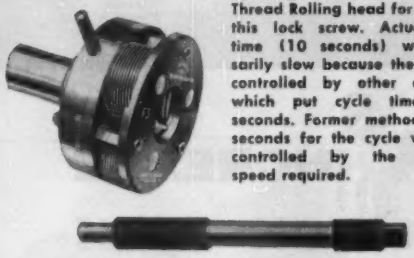
WITH NATIONAL ACME

thread rolling TOOLS and ROLLS

these users get
better threads, faster, . . . at reduced costs

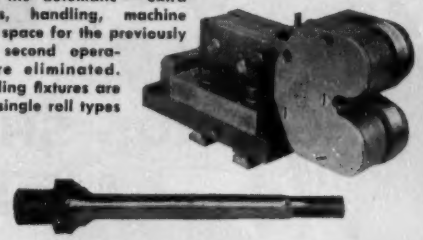
CASE STUDY (A)

Faster cycle time on the automatic machine setup was accomplished by using a National Acme "Fette" Thread Rolling head for threading this lock screw. Actual rolling time (10 seconds) was necessarily slow because the feed was controlled by other operations which put cycle time at 15 seconds. Former method took 29 seconds for the cycle which was controlled by the threading speed required.



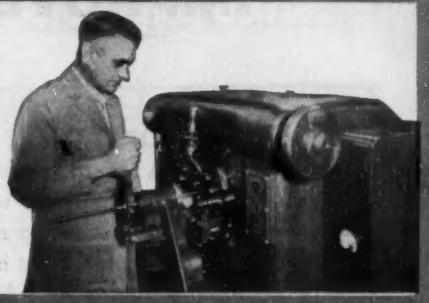
CASE STUDY (B)

With a National Acme fixture to roll the thread behind a shoulder, all operations on this bicycle pedal hub were completed in one setup on the automatic — extra man-hours, handling, machine and floor space for the previously required second operation were eliminated. These rolling fixtures are made in single roll types as well.



CASE STUDY (C)

Better production with no trouble and at lower cost attests to the advantages of the National Acme TR-1 thread rolling machine for this long shaft job. The .521"-5 ball thread is rolled in 45 seconds for the 33" pieces. Adaptable for hand or magazine feed of small parts the hydraulically operated TR-1 machine utilizes National Acme rolls for threading, knurling, burnishing, etc. — two and three roll heads interchangeable.



There is no way you can thread a piece faster than by thread rolling . . . no better way to roll a thread than with National Acme thread rolling equipment.

And, whether your National Acme thread roller is the Fette Head, the Straddle-Type Fixture or the TR-1 Machine, *ALL* your rolled threads are more accurate, stronger and smoother when you use **GENUINE NATIONAL ACME THREAD ROLLS**—made only for National Acme Thread Rolling Tools.

Results like these are being shown every day by users of National Acme thread rolling equipment. Results that measure up to the tolerances and finish that your specs call for—at cost reductions that keep you in the competitive market.

Literature on request, but why not ask for comparative figures on your jobs.

This emblem identifies quality rolls for your National Acme thread rolling equipment.

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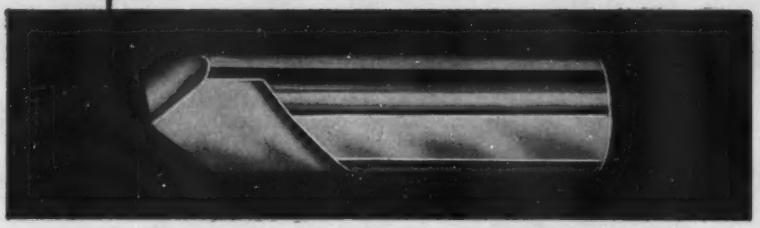
ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing

ATRAX IN ACTION



RECORDS SHOW 500% INCREASE IN PRODUCTION WITH IMPROVED BORING TOOL BIT

A CASE HISTORY: One of our customers had experienced considerable difficulties in boring tapered holes in stainless steel. The specifications called for extremely close diameter and taper tolerances, and a finish requirement of ten micro-inch. The carbide tool previously used gave the customer a production of one piece part, containing eight holes, per eight-hour day. With the new Atrax superior finish ground boring bit, production increased to about five piece parts per day. One tool bit roughed out and finished eight holes before resharpening was necessary, and the finished product was eight micro-inch or better. Atrax Solid Carbide Tool Bits improved production in this instance by over 500%.

Possibly our engineers or sales representatives can help YOU achieve similar savings. You'll find them in all principal cities, ready to consult without any obligation.

NEW! Complete 88-page Manual and Catalog of Carbide Tools. Write for your free copy.

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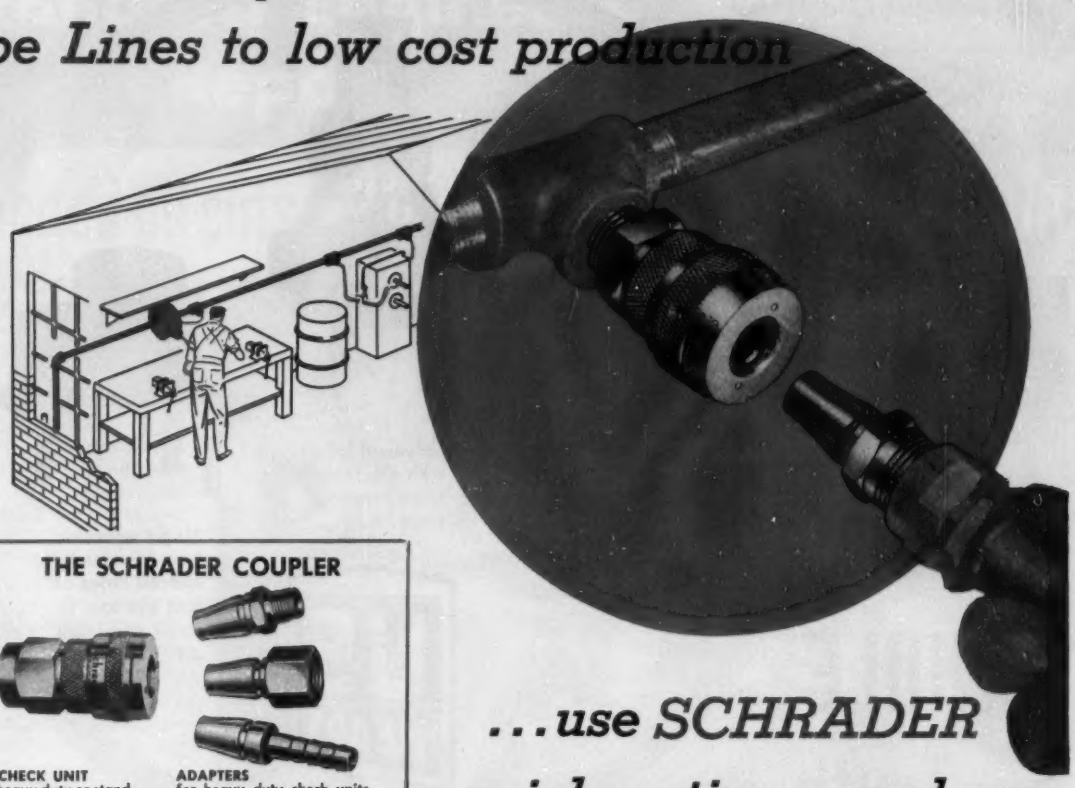
Make your Air Lines Pipe Lines to low cost production



THE SCHRADER COUPLER

CHECK UNIT heavy duty or standard type — with or without swivel — with male or female inlet threads

ADAPTERS for heavy duty check units — or standard units — with male or female threads, or serrated shank — for many pipe and hose sizes

...use SCHRADER quick-acting couplers

Spot **Schrader Couplers** everywhere in your plant—along benches... on columns... *wherever an air outlet means convenience.* Schrader Quick-Acting Couplers make air as easy to "plug in" as electric current. Yes, bring air to the job, not the job to the air line—and you'll get greater portability in your air tools ... eliminate extra lengths of hose and miles of foot steps.

Schrader Couplers are quick ... they're safe ... they're sure.

To connect, just push the adapter section into the check unit. *Accidental* uncoupling is impossible—it takes a positive manual twist of the check unit sleeve to disconnect the coupler and shut off the air.

Make compressed air accessible in your plant, as the largest and most modern plants have done. Schrader Couplers are available in many pipe thread sizes and hose adapters. And remember—Schrader produces a full line of cylinders, valves and other air control equipment, to make your compressed air circuits neat ... efficient ... reliable. For details, write today—or fill out the coupon below.

Schrader

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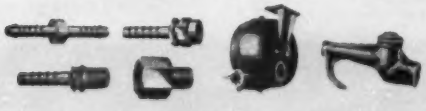
Leaders in air control since 1844



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Division of Scovill Manufacturing Company, Incorporated
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Name _____ Title _____

Company _____

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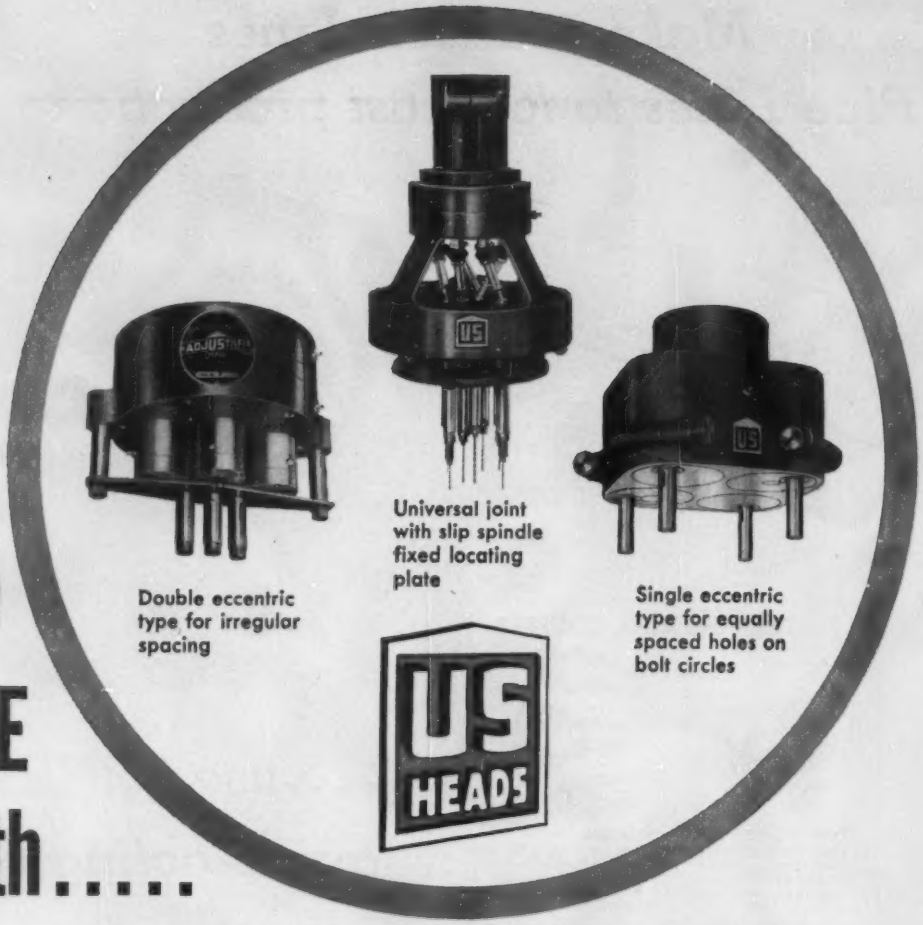
It's the wHOLE Truth.....


Double eccentric type for irregular spacing
Universal joint with slip spindle fixed locating plate
Single eccentric type for equally spaced holes on bolt circles
US HEADS

Machine tool men "in the know" have long acclaimed the "US" Adjustable Multiple Spindle Drill Heads with their quick-change universal joint assemblies. They are built for continuous use, with full anti-friction bearing construction for high capacity thrust loads. The universal joint adjustable multiple spindle type is suitable for any sensitive drilling machine. Joints are self-lubricating.

The single eccentric type is used for equally spaced holes on bolt circles.

The new double eccentric AdjUStafix, two to eight spindles, permits spindles to be located in non-symmetrical patterns. It eliminates expensive change in set-up.

Write for details on any type of universal joint adjustable head. Ask also about our totally enclosed gear-driven adjustable, fixed center, or individual lead screw tapping heads.

UNITED STATES DRILL HEAD CO., 616-618 Burns St., Cincinnati 4, Ohio

Standard Engineer's Report

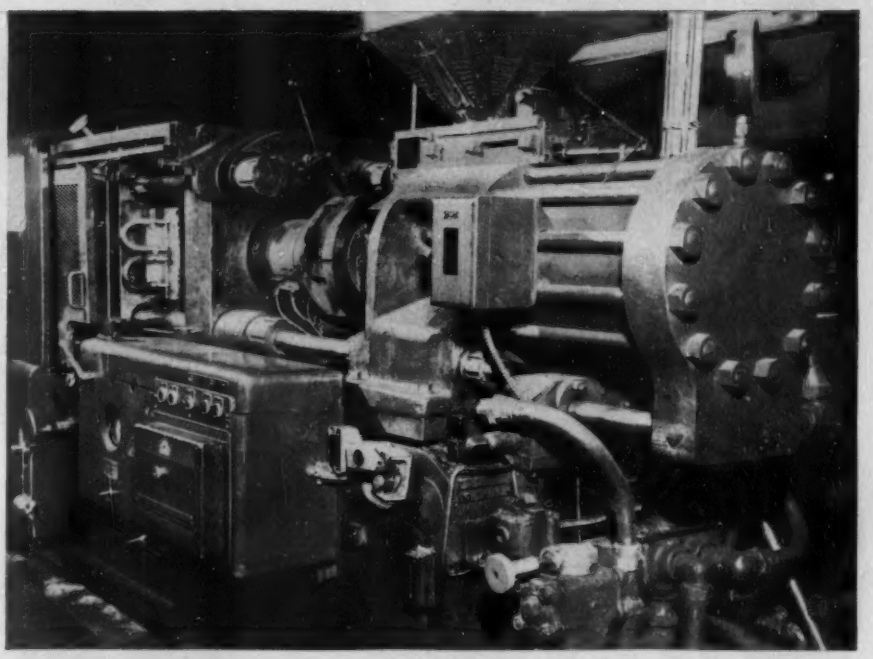
CASE HISTORY

PRODUCT *Calol OC Turbine Oil*

FIRM *Windman Brothers, Los Angeles, Calif.*

Inhibited oil cuts maintenance costs $1200 a month!

BEFORE USING CALOL OC TURBINE OIL in the hydraulic system of this and 9 other plastic injection-molding machines, Windman Brothers, Los Angeles, shut down an average of 4 machines a month to clean oil deposits from valves. Parts, labor, and down-time cost $1200 a month. Calol OC Turbine Oil stopped this trouble and has eliminated repairs due to lubrication on all of the machines for more than 5 years. The oil stays clean in spite of operating at constant temperature of 135°F. and under 1000 psi pressure, 24 hours a day, seven days a week. The machines make many kinds of plastic objects. Windman Brothers have produced more than 50,000,000 fountain pen parts like those shown below.



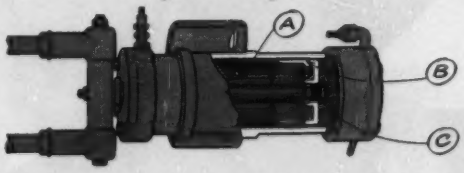
FREE CATALOG: "How to Save Money on Equipment Operation," will be sent on request to Standard Oil Company of California, 225 Bush St., San Francisco.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your distributor, write or call any of the companies listed below.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

How CALOL OC Turbine Oil cuts costs in hydraulic systems



Used as the hydraulic medium in feeds and lifts of any kind, Calol OC Turbine Oil will not form carbon or foam excessively.

A. Contains very effective oxidation inhibitor—will not deteriorate and plug lines and retard action of cylinders.

B. Corrosion inhibitor prevents rusting and pitting—has high metal-wetting ability.

C. Separates readily from water or other contaminants—dirty oil may be reclaimed easily...charge lasts indefinitely, leakage only cause for replacement.

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225 Bush Street • San Francisco 20, California

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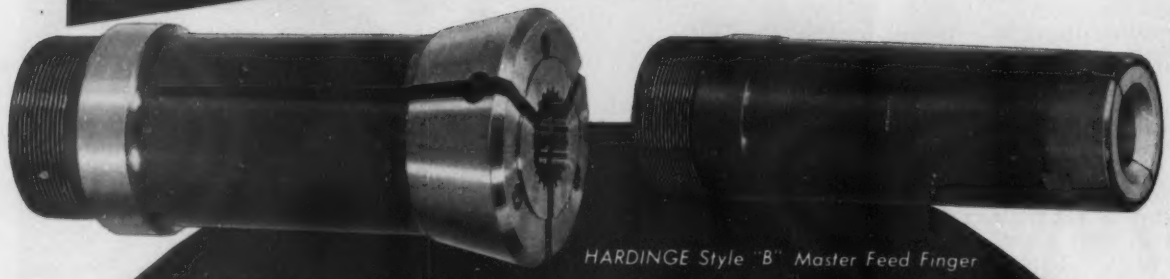
HARDINGE COLLETS and FEED FINGERS
for ACME-GRIDLEY Automatics*

HARDINGE
ELMIRA, N.Y.

- **30% to 80% Lower Tooling Cost**
- **Higher Production Efficiency**



HARDINGE Style "B" Master Feed Finger

HARDINGE Style "S" Master Collet

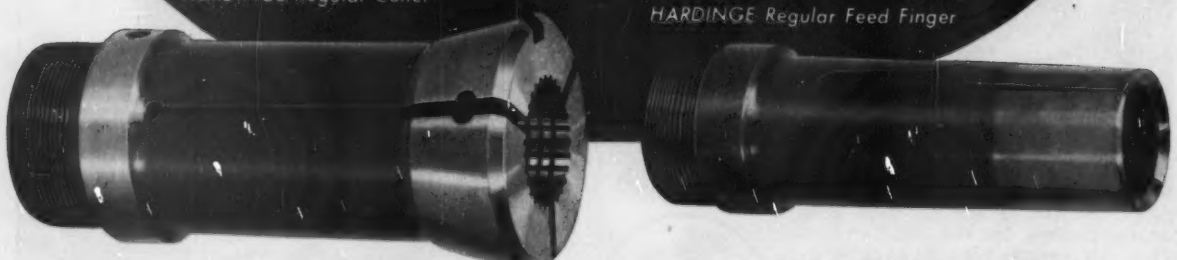
30% to 80% lower tooling costs result when using Hardinge Master Collets and Master Feed Fingers with low-cost replaceable pads.

Quick change-over because Master Collets remain in place while changing pads. Master Fingers remain in the feed tube—no wear on feed tube threads. Make Hardinge your one source of supply for all collets and feed fingers. You will have fewer work interruptions due to breakage, loss of tension, and scoring of stocks.

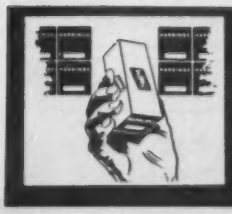
Hardinge brings you 62 years of engineering and manufacturing experience.

HARDINGE Regular Collet

HARDINGE Regular Feed Finger



* Also available for the following automatics: Cone, New Britain, Greenlee, Gridley, National Acme.



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HARDINGE BROTHERS, INC.
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"You name it . . .

KING does it"

. . . at BELOIT IRON WORKS

Rugged KING® Vertical Boring & Turning Machines are noted for their durability, precision, and versatility. For example—at Beloit Iron Works, Beloit, Wisconsin, KINGS are called upon for *versatility plus* in machining grey iron castings. "Jobs run the gamut from light to heavy, large to small," says this customer. "There's boring, turning, facing, forming . . . taking light cuts, interrupted cuts, heavy cuts. In a word, we find that with KING machines it's a case of *you name it—King does it.*"

It will pay *you* to get first-hand information on the wide variety of precision work that KING machines can handle in your production. You, too, will find that in range of feeds and speeds, in ease of control, in extra weight and accuracy-maintaining rigidity, KING will meet *all* job requirements at a *profit.*

KING machines are available in ten sizes—30" to 144"—the widest size range in the field. See your KING distributor, or write us direct, for details.

AMERICAN STEEL FOUNDRIES

KING MACHINE TOOL DIVISION

Vertical boring & turning machines . . . 1150 TENNESSEE AVE., CINCINNATI 29, OHIO

ARMSTRONG
TOOL HOLDERS...
for every operation!

There are ARMSTRONG Tool Holders in sizes and types for every operation on lathes, planers, slotters and shapers —for the heaviest cuts; for the most delicate cuts.

With Standard shaped cutters, bits and blades of ARMSTRONG HIGH SPEED, ARMALOY (Cast Alloy) and ARMIDE (Carbide-Tipped) they provide a system of tooling that assures maximum production per machine hour, lower tool costs, and higher machining profits.

These permanent multi-purpose tools can be picked up as needed from your industrial distributor. Use them wherever possible to increase number of pieces per hour, to lower cost per pieces.

Write for Catalog

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. Armstrong Ave. Chicago 30, Ill.

. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .

ASK BAIRD ABOUT IT

TO GO FARTHER

FOR THE SAME "FARE"

get a Transfer

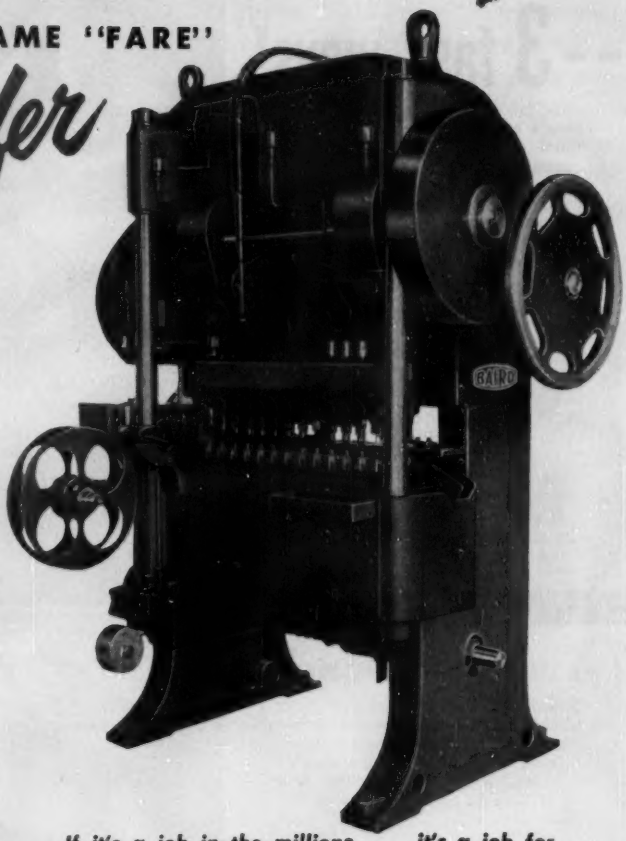
This one, completely automatic machine, the Baird Transfer Press, turns out accurately-formed metal parts at a rate of thousands of pieces per hour . . . often with 10 to 14 operations on each. Surely this is high production at its best.

Human-like transfer fingers automatically grip and carry the work to progressive die stations where blanking, drawing, piercing, embossing, slitting, trimming, sizing, hexing, forming, etc., complete the piece. Such operations combined in a single cycle definitely reduce costs to a great degree.

The machine pictured is but one of 12 standard sizes which have rated working pressures from 5 to 55 tons. Coiled stock from 2½" to 4" in width is automatically fed in feed lengths from 2" to 3½".

Tooling possibilities are almost endless . . . with set-ups that produce millions of small parts for the widest variety of uses.

Get yourself a "Transfer" for an extended "ride" to a favorable competitive position in this buyer's market. "Ask Baird about it." Write Dept. AM.



If it's a job in the millions . . . it's a job for

BAIRD *automatic*

MULTIPLE TRANSFER PRESSES

THE BAIRD MACHINE COMPANY

STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

If there's a better way to bore...Davis does it!

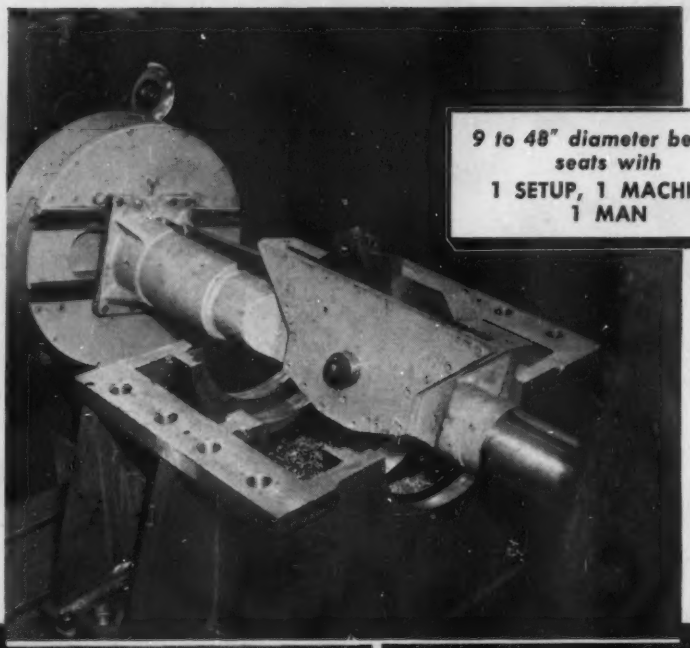
NEW spherical boring tools cut machining time, maintain closer tolerance, improve finish

--3 fast ways!

Here's another profitable operation performed by a Davis spherical boring tool, mounted on a continuous feed facing head. These special tools are currently being used in machining 9" to 48" bearing seats of pedestals and caps. High-speed steel and tungsten-carbide cutting tools are used.

As reported by a large electrical equipment manufacturer, the new tool has considerably reduced floor-to-floor time and tool breakage. What's more, it maintains closer tolerances and produces a better finish than was previously possible. The Giddings & Lewis continuous feed facing head, used to drive the spherical tools, is also used to complete all facing, straight boring and grooving on the same setup. Formerly, multiple setups on various machines were required.

If you've a spherical boring problem, chances are one of the three types of Davis tools shown below is the answer.



9 to 48" diameter bearing seats with
1 SETUP, 1 MACHINE, 1 MAN

1. FOR LARGER WORK—24 to 48" bore range

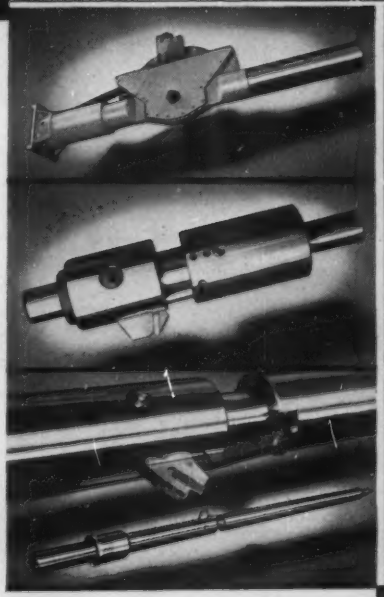
Spherical motion of block-type cutter is produced through the simultaneous action of tool rotation and spindle advance. Spindle arms and swinging arms are mechanically linked. Covers these ranges: 24 to 31", 31 to 39" and 39 to 48" in diameter.

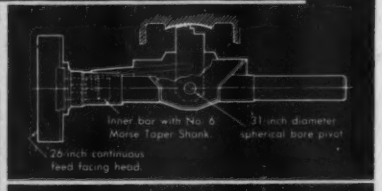
2. FOR MEDIUM WORK—8 to 12" bore range

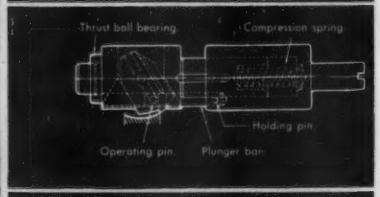
This tool is actually a bar within a bar. The cutting block is positioned by the ball thrust bearing contacting the face of the lathe spindle. Motion of outer bar relative to inner bar moves the block-type cutter through a spherical path.

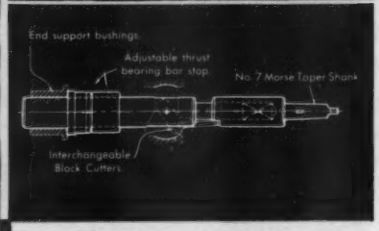
3. FOR SMALLER DIA.—8 to 13" bore range

An adjustable stop collar that registers on the face of the end support bushing can be clamped anywhere along the bar. The collar positions cutter on the center of the proposed bore. Bar rotation and spindle advancement move cutter through an arc to produce the spherical bore.









What's your boring problem?
Davis offers you a complete tooling service to solve any routine or extraordinary boring problems. NEW spherical boring tool and complete Davis line are described in Catalog 304. Send for a copy today.

REMEMBER — If there's a better way to bore it — Davis will know it. And if Davis can't bore it — it can't be done!

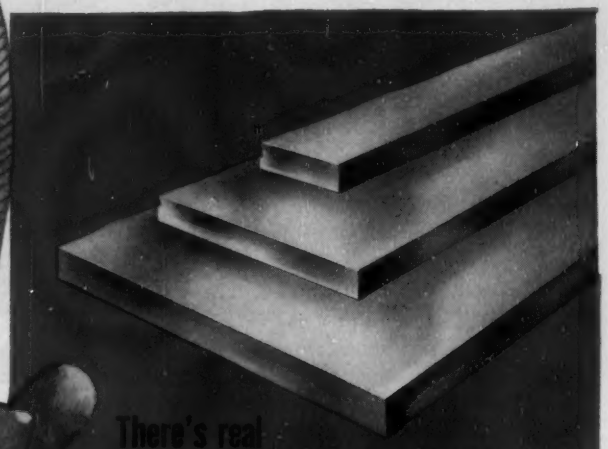
DAVIS
BORING TOOL DIVISION
OF GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Mon!...there's real control of ALL THREE

You can save time ... improve work quality ...reduce cost...with J&L Wide Cold Rolled Flats

J&L Wide Cold Rolled Flats are a "machine shop natural." They save you time, trouble, and money in replacing forgings, expensive castings, or parts ordinarily made from hot rolled plates planed to size.

In such applications as die build-ups, stripper plates, punch pads, jigs and fixtures, plate and die molds, pattern plates, and other machinery parts J&L Cold Rolled Flats offer outstanding advantages.



There's real control for 3 GOOD REASONS

1. THEY REQUIRE LESS MACHINING (they are true to size and section)
2. THEY NEED LESS FINISHING (they have a smooth, cold rolled surface)
3. THEY ELIMINATE FABRICATING OPERATIONS (they are available in a wide range of widths and thicknesses)

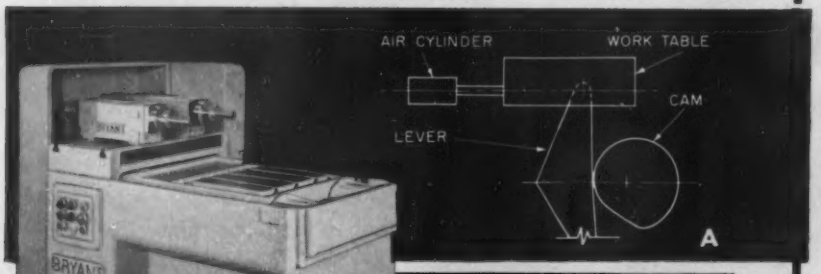
RANGE OF SIZES: Widths—up to 14¼" Thicknesses—⅜" to 2"

Order from your local J & L Distributor or Warehouse

J&L STEEL

Jones & Laughlin STEEL CORPORATION — Pittsburgh

A NEW APPROACH TO PRECISION BORING



HIGHER PRODUCTION RATES— This Bryant Boring Machine produces uniform fine finishes — at peak production rates. It assures highest repetitive accuracy in precision boring, drilling, turning, facing, grooving and contour boring and turning.

The table is actuated by a simple cam and lever unit **A** which provides positive control of the cycle at all times. This mechanical actuation eliminates variation in the cycle due to temperature change.

FINER FINISHES— The Bryant 998 provides the smooth, uniform table motion so essential in generating a fine finish with a single point tool. The table moves on two 4" diameter solid steel slide bars **B** firmly bolted to the bed. The table is supported by two anti-friction preloaded ball bearings on each of these bars. This construction provides a metal-to-metal contact which eliminates shifting due to an oil film **C**.

MINIMUM DOWN-TIME— The Bryant 998 requires minimum servicing — motors, boring heads and slides are permanently grease sealed. Every unit is easily accessible.

SPECIFICATIONS— Total table stroke: 6"; Top of table to top of bridge: 4"; Width of bridge: 27⅜"; Multiple boring heads as required by tooling to a maximum of 4 (209) heads; Boring head motor: 5HP; Table dimensions: 17½" x 22"; Floor space (without coolant tank): 31" x 54".

20 REASONS WHY...

- Bed, bridge, table and heads are normalized Meehanite castings.
- Cam actuated table moves on preloaded ball slide bars.
- Cam is hardened and ground.
- Boring head spindles rotate in preloaded ball bearings.
- Air cylinder opposes the work table motion directly with constant pressure and keeps the cam follower roll and the cam always in contact.
- Boring head drive is completely accessible.
- Cam drive assembly is protected by a torque limiting clutch.
- Cycle time is controlled by precision change gears in the cam drive gear box.
- Pad is provided at the rear for mounting accessory equipment.
- Push button controls are conveniently located.
- Manual, semi-automatic or fully automatic cycle.
- Emergency stop button instantaneously interrupts the cycle.
- Jog buttons on both front and rear of the machine for setup purposes.
- Machined setup pads are provided on the bridge for ease in locating fixtures.
- Maintenance is necessary at only three points: two grease fittings on the cam follower assembly and cleaning and filling of the filter-lubricator unit in the pneumatic system.
- Ball slide table is grease sealed.
- Gear box has its own closed lubrication system.
- Boring head bearings are permanently grease sealed.
- Cam is easily accessible for changing the table stroke.
- Change gears are enclosed in their own wet sump, splash lubrication system.

Write today for complete details!

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SPRINGFIELD, VERMONT, U. S. A.

Internal Grinders • Boring Machines
Internal & External Thread Gages • Granite Surface Plates

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6080 OPERATIONS PER HOUR

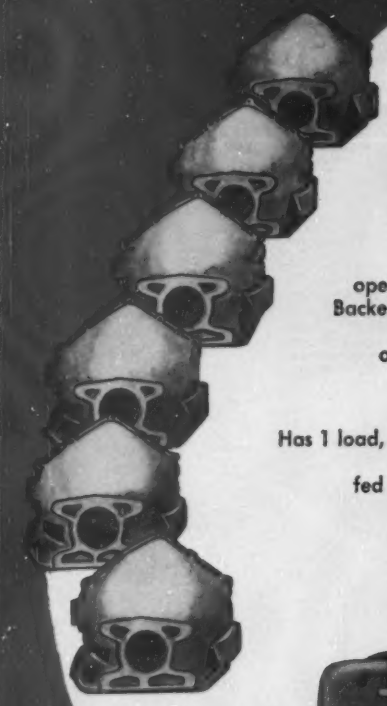
with one operator

Baush 9-Station Mechanical Transfer speeds machining operations and lowers production costs on automotive clutch housings.

There's no questioning production efficiency and low costs when operations can be speeded and simplified in this way. Backed by over 50 years of designing and building automatic machine tools, Baush Engineers can be of real help to you in solving your machine operations. Why not send us your prints NOW — there is no obligation, and our staff would enjoy working with you on your problems.

9-STATION MECHANICAL TRANSFER:

Has 1 load, 6 work, and 2 idle stations with 11 mechanical power units and 3-way checking fixture. . . . Three 3-position mechanical transfer bases are fed by automatic pallet conveyor with 11 pallets. Hydraulic clamping and unloading of part in work-holding pallets. Locators for work holding pallets are hydraulically raised or lowered. Each work station hydraulically clamps pallets, which are mechanically transferred from station to station.



OPERATIONS:

Drill, rough bore and ream, counterbore, spotface, chamfer and tap for a total of 64 operations in each clutch housing.

PRODUCTION:

95 clutch housings per hour at 100% efficiency, or a total of 6080 operations per hour with one operator.

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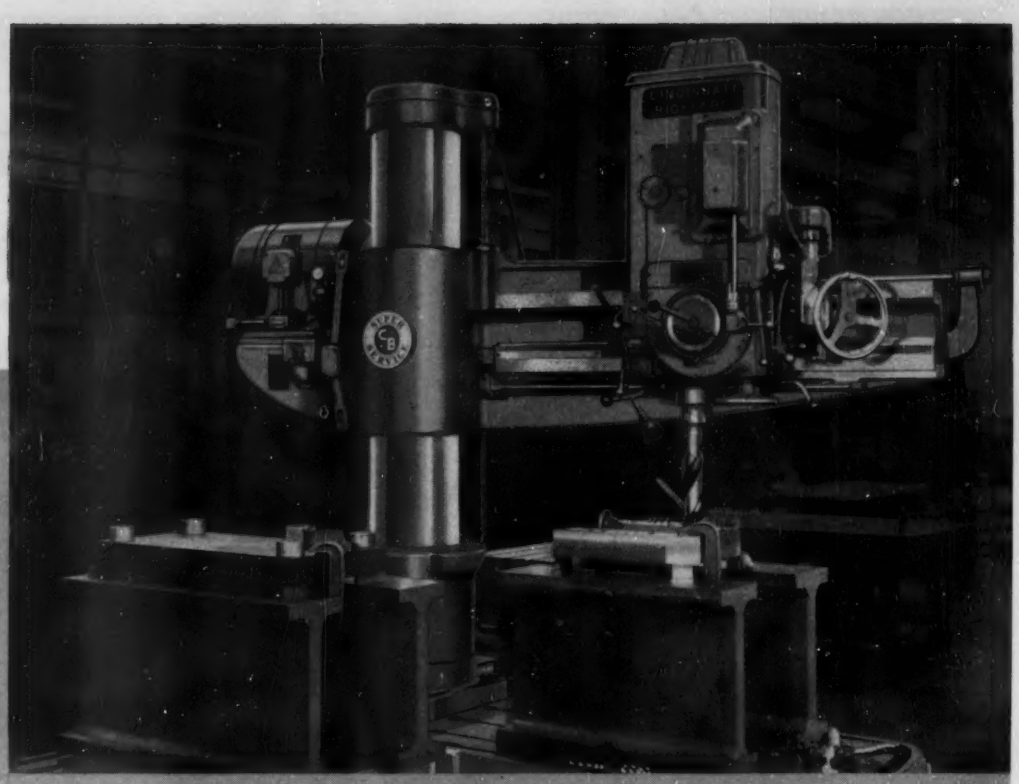

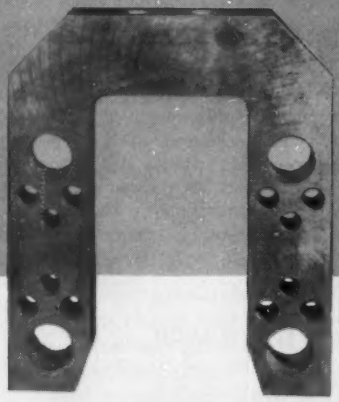

50% SAVED

IN DRILLING OPERATIONS ON

PROGRESSIVE DIES, TOOLS, JIGS, FIXTURES

The piece shown is an anvil on horn tube Pierce die.

•

Photos courtesy Koppy Tool & Die Company, Ferndale, Michigan

The capacity and performance of this Cincinnati Bickford Super Service Radial has effected real savings in the shop at Koppy Tool & Die Company. On the operation shown a 50% saving was effected with the installation of this new Bickford Super Service Radial. eighteen holes are being drilled from 1 27/64" to 3".

Write for Catalog R 29 on Super Service Radials—there's a size for your needs.

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RADIAL AND UPRIGHT DRILLING MACHINES

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for Quality Reamers

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EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Wrong Alloy

In your article, "Belt Grinding of Titanium," (*AM*—June 7 '54, p167) we noticed a misleading statement which we feel sure you will want to correct.

Reference was made to the alloy furnished by Mallory-Sharon Titanium Corp, Niles, Ohio. It stated that the standard MST 3A1-5Cr alloy grinds poorly, and referred to this as a high-carbon type. It then stated that an experimental form of this alloy with low carbon gave excellent results.

What you referred to as the "standard" alloy was made by induction melting, a process which Mallory-Sharon discontinued over a year ago, when they announced development of their Method "S"—a consumable-electrode, double-melting process—which results in no carbon contamination whatsoever, beyond what is in the sponge raw material, while at the same time, giving outstanding homogeneity and quality.

The MST 3A1-5Cr alloy made by double-melting is anything but experimental, but is the alloy Mallory-Sharon has been furnishing for the past several months.

As the statement in the article would give the average reader a negative opinion, we would appreciate it very much if you would restate the facts about this alloy.

Howard V Reed
The Griswold-Eshleman Co
Cleveland

Calling Dick Tracy

In reference to the article, "Stop Thief," (*AM*—Mar 15 '54, p156) I agree with Bert A Hale that petty theft in many shops results in an expensive annual loss that is very difficult to stop. Locked storerooms with reliable storekeepers and perpetual inventory are good theft reducers, especially on small, expensive items. Vigorous prosecution of caught culprits is a great deterrent for others who may be just starting. Frequently, good judgment on the part of management is an excellent factor in reducing losses.

I remember an incident where a manager's prompt and unexpected action recovered a valuable item. This occurred in a large rubber-products plant. An old employee, Bill, had been given a gold watch by the company for twenty-five years of service. He was very proud of this gift and wore it regularly. One hot

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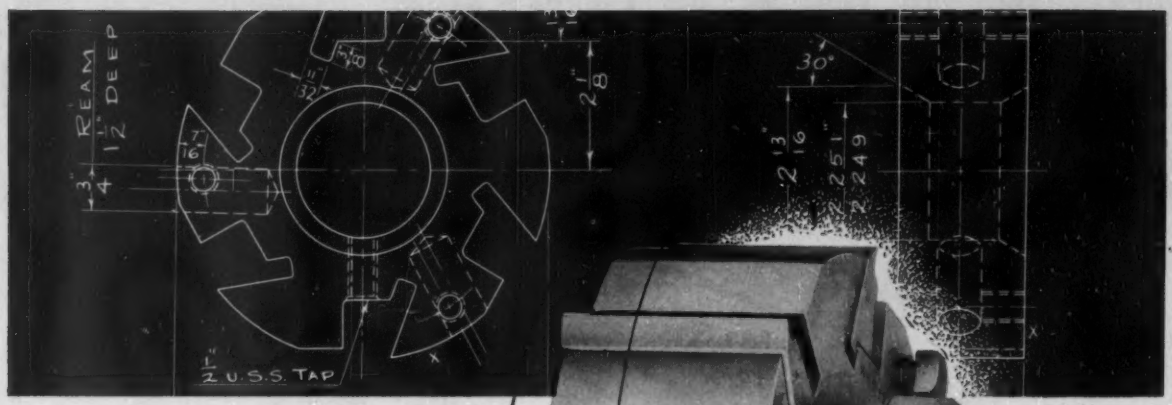
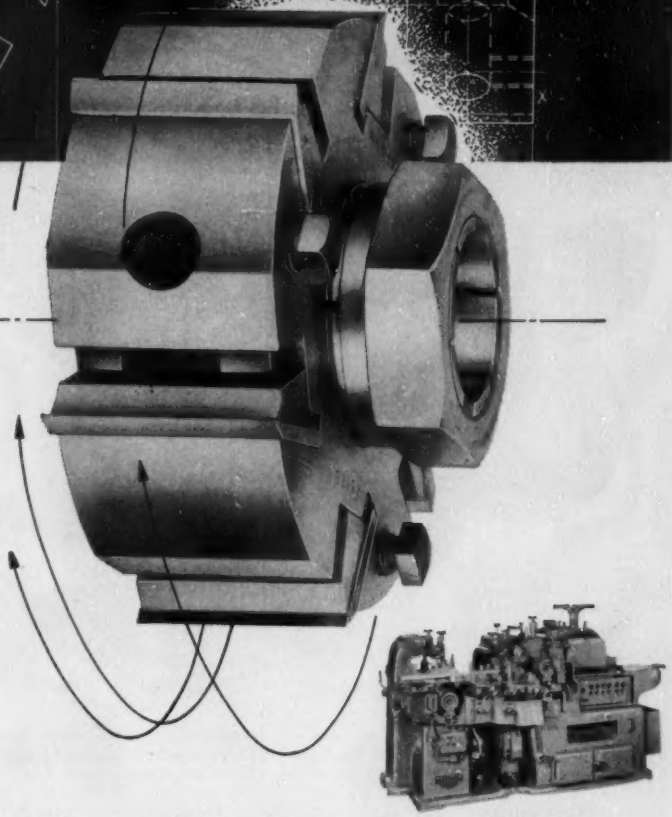


MAX-EL

alloy steel cutter head
for high-speed
electric moulder
finish-machined
after
heat treatment



You're looking at the "firing line" part of Mattison Machine Works' No. 276 High-Speed Electric Moulder. For this cutter head holds six knives that travel at up to 7200 rpm to do the machine's work of fast, vibration-free woodworking.

Hot-rolled Crucible MAX-EL® 3½ was chosen for this vital part. The forged and annealed MAX-EL blank is rough machined, then heat treated to 26-30 Rockwell "C" – *and then finish-machined.*

The remarkable machinability of MAX-EL after heat treatment... its dimensional stability... and its uniformity, which permits heat treating to a very close range of hardness – these characteristics make MAX-EL an ideal choice for vital machine components such as this cutter head.

But try MAX-EL in your own shop. You'll see for yourself how these outstanding properties mean *faster* machining... *fewer* rejects ... *longer* tool life. On your next order for alloy steel – include MAX-EL. For immediate delivery – *call Crucible.*

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2 *Serial Numbering into Metal Shaft*
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This multi-purpose Roll-O-Mark can be set up faster . . . tooled up easier . . . accommodates attachments more readily than any other marking machine. With all-pneumatic operation, no motor or separate power unit is required. Simply connect to the shop's air line—air is used *only* when in operation. This multi-purpose metal marking machine offers many other advantages such as — 5" die slide stroke . . . open throat design . . . hand wheel for rapid table elevation . . . independent control for set up.

Whatever your needs for metal marking, Noblewest makes the machines, marking dies, and work-holding fixtures for doing the complete job faster, better, at lower cost. And remember, Noblewest Roll-Marking is permanent marking—*good for the life of your product.* There is a Noblewest Representative near you. Write Noble & Westbrook Manufacturing Company, 16 Westbrook Street, East Hartford 8, Conn.

ADDITIONAL EQUIPMENT AVAILABLE WITH MODEL 50P1

• Automatic Air Ejector • Dial Feed Table —Air-Operated • Automatic Indexing Attachment—to numbering head for consecutive serial numbering • Automatic Cycling

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NOBLEWEST IMPROVED MARKING DEVICES

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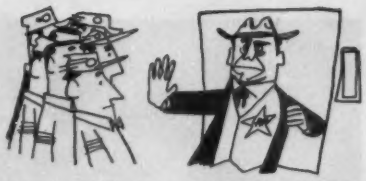
ORIGINATORS OF THE ROLL MARKING PROCESS



day he had hung his vest, with his watch in the pocket, behind his machine, and about a quarter of an hour before quitting time he discovered that some thief had stolen the watch. Bill immediately went to the manager and reported the loss. The manager told him to return to his work and said he would try to recover the watch which, he said, most probably was still in the plant.

When the quitting whistle sounded there was the regular rush to the exit doors where, to everyone's surprise, a guard was posted and no one was permitted to leave. The word got around fast that someone had stolen old Bill's watch, that some detectives were on their way from headquarters to the plant, and that everyone was to be searched before being permitted to leave.

After ten minutes, the manager came in and told the guards that, while the theft was a very serious matter, it was not right to keep a lot of innocent people from going home, and that evidently the detectives had run into some unexpected delay. He ordered the doors opened and said that everyone was permitted to go. Then he took Bill back to his machine, where they hunted around for a few minutes before finding the watch on a shelf in Bill's tool closet. Evidently, as soon as the thief heard about the searching of all persons he became scared, slipped back into the plant, and put the watch in Bill's cupboard.

Later in the evening, when the janitors were cleaning up, they made an interesting discovery. Down the stair well at the foot of the stairs from the second floor, where rubber heels were inspected and boxed, they found almost a bushel of top-quality rubber heels. It was obvious that employees of this department had a hapit of keeping themselves and their friends well supplied with heels.

When those who had several pairs in their pockets were on their way down the stairs and heard about the threatened search, they dared not rush back to the packing room to get rid of the plunder, so they simply slipped the "hot" items through the railing and dropped them into the well.

A change in the method of checking items into and out of all the packing departments resulted in a

big saving in cost as well as a sizeable reduction in the disappearance of many items that had bothered the company for many years.

A successful method of reducing pilferage is used by one concern which declares as salvage any parts, materials, and used equipment that are not considered worth the expense of recovery. All this material is checked by the salvage inspector, who puts a price on it, either so much a pound or so much an article. It is then delivered to the salvage sheds which any employee can visit for half an hour before starting time, half an hour after quitting, or during the noon hour. He can buy whatever he wishes and is given the material as he pays and a pass to take it out. Once a month all remaining salvage is sold to a junk man on bids. Employees are also permitted to bid if they so desire.

This arrangement has proven most satisfactory and the employees are happy because they now can obtain odds and ends to make things for the home at a salvage price. Also no one has an alibi if caught toting something home, for he cannot claim, "It is just some scrap that is of no use to the firm anyway."

Many firms are as much to blame for their losses as the men who "swipe" things. They permit such a sloppy method of handing out tools and supplies that no one really knows who has what. I remember one toolroom where the storekeeper frequently had to phone the purchasing agent about new equipment and supplies, and when he was thus tied up on the phone, if anyone came to the window he would take the order, trip the door open, and tell the man to go and get it. The man was thus back of the shelves and among nice shiny micrometers, vernier rules, and other tempting equipment which he could slip into his pocket, if he so desired, with no chance of detection. The company's losses were very high, although it did save a few dollars a week by having the storekeeper phone about materials and equipment which saved the purchasing agent's clerk from having to go into the storeroom and check up urgent requisitions for himself.

George P Pearce
Albuquerque, N M

Get These 4 Unparalleled Advantages For *Your* Toolroom

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The ACE is EASY to operate because it requires no computation . . . the direct reading for clearances reduces fatigue, eases operators' jobs in grinding the most difficult cutters.

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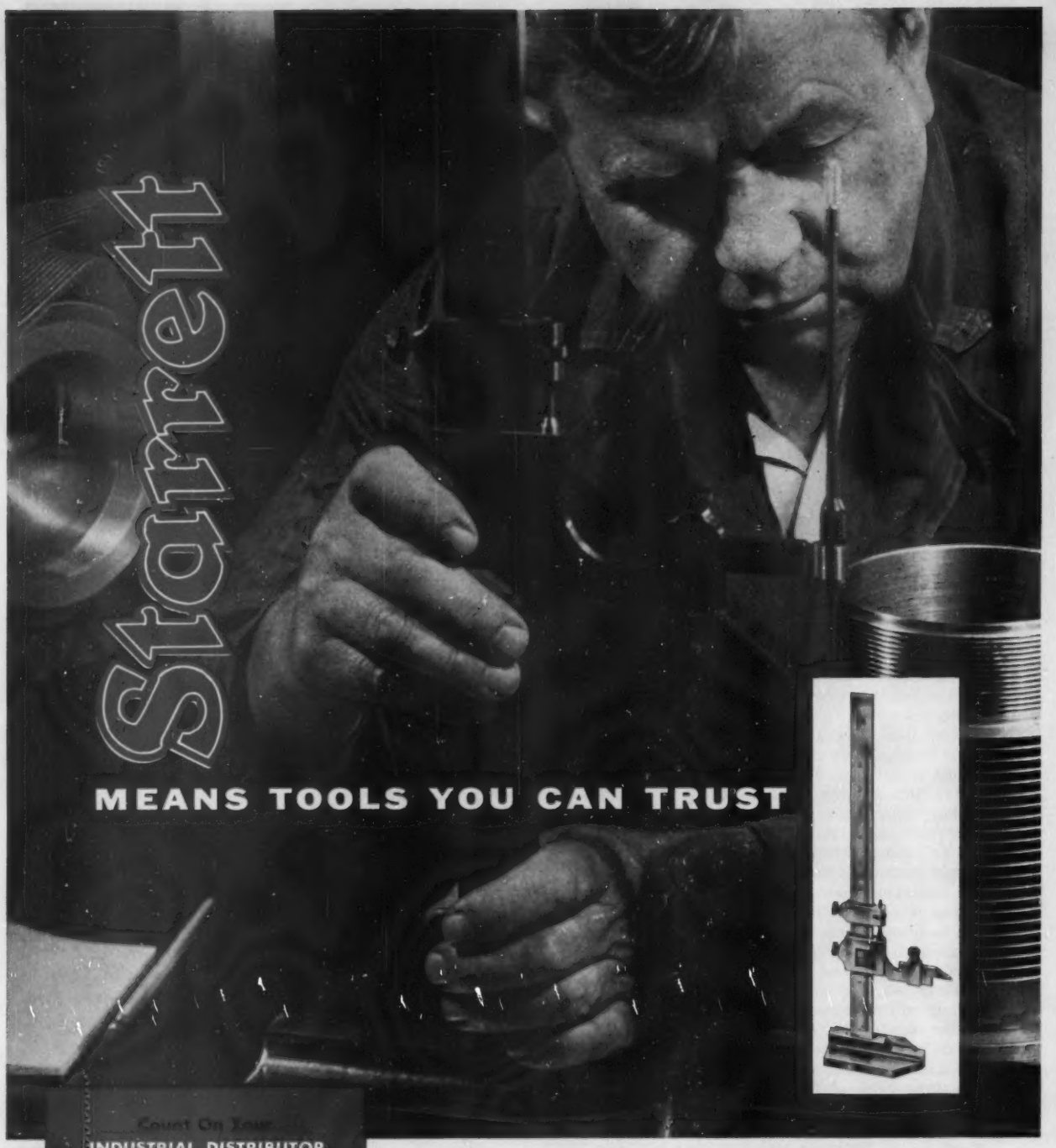

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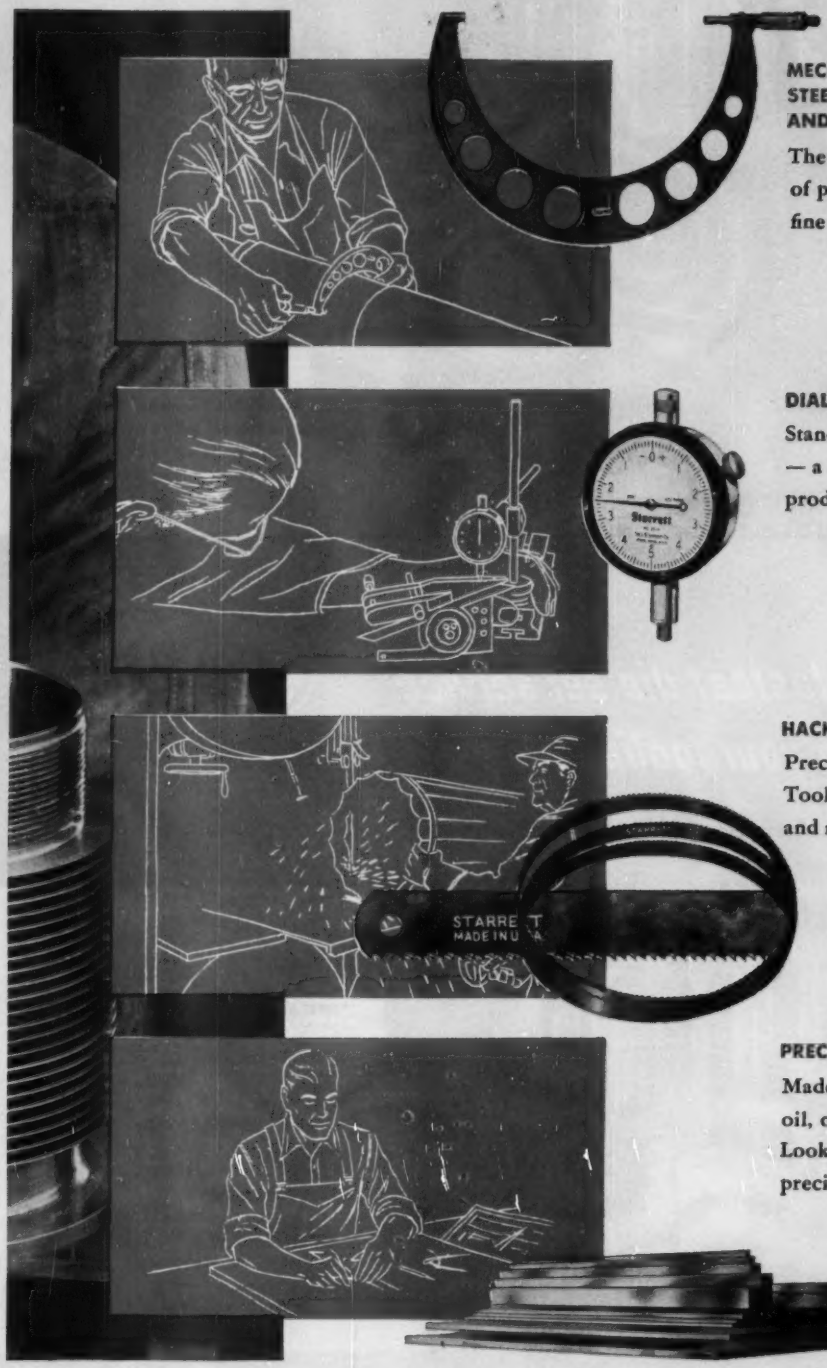

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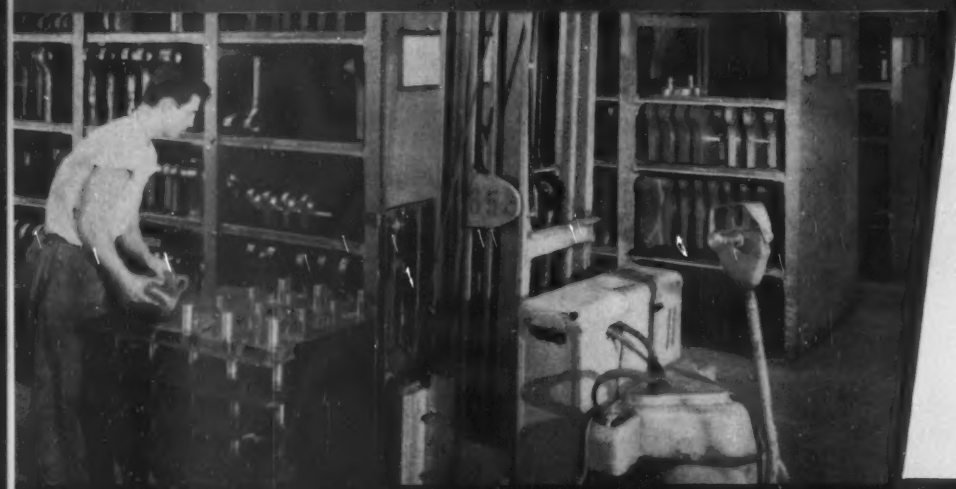

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Spot News of Metalworking . . .

- **GUIDED MISSILES . . .**
  Research and development of guided missiles today costs as much as for all conventional aircraft, with annual budgets running to nearly $300 million. The Defense Dept's tab for guided missiles since WWII: $1.6 billion for research and development, $4 billion for procurement, $200 million for testing.

- **TOOLING LEASING . . .**
  Leases for everything from million-dollar tooling packages to individual tools, dies, molds, jigs and fixtures are available through a plan offered by Mechaneers Inc of Bridgeport, Conn. Leases are of 1-5 years' duration, at regular bank interest rates, with option to buy at any time.

- **TITANIUM ALLOY . . .**
  Lightweight titanium alloy that can replace steel in heavy military weapons and tanks has been developed at Illinois Tech. Alloy is 40% lighter than high-strength steel, is highly corrosion-resistant, has tensile strengths up to 192,000 psi — 40,000 psi stronger than any existing commercial titanium alloy.

- **AIRCRAFT MONEYSAVERS . . .**
  A $30 plastic assembly that takes the place of a $76 metal assembly, and annual savings of $3500 from using a commercial putty for molding dams when pouring molten metal and plastics in tool fabrication, are dollar-saving production wrinkles reported by the Aircraft Industries Association.

- **STRIKE COMMUNICATIONS . . .**
  Do employers communicate with workers during a strike? New York University asked 32 New York firms who had strikes last year that question. The answers: (1) 66% did, (2) 34% didn't, (3) in short strikes, where production was fully maintained, companies mostly didn't, (4) in long strikes they did.

- **EAST-WEST EMBARGO . . .**
  With easing of embargo on shipments of production equipment and other capital goods behind the Iron Curtain (but not to Red China), Russia's shopping list for Western-made products takes on greater importance. See p165.

- **SCALE REMOVAL . . .**
  Two processes for removal of scale from titanium and stainless steel after heat treatment have been developed by an aircraft manufacturer. One forms a physical barrier that inhibits scale formation; the other converts the scale chemically. With one process, scale can be pickled off in 10 min; in 2-4 min with the other.

- **EUROPEAN STEEL FOR CLEVELAND . . .**
  European-rolled structural steel has recently been delivered by ocean-going cargo ship direct to Cleveland, where it is being peddled to Midwestern users.

Grinding 5-Start Worm with 4" Lead

STANDARD STYLE 36

EX-CELL-O *Precision* THREAD GRINDER

In the photograph at the left the operator is grinding a worm shaft for use in a special machine. The part is about 22" long and the worm is 4½" long, 3.430" O.D., has 5 starts, a pitch of .800", a lead of 4" and a tooth depth of .5454". The worm was ground in two operations on a standard Style 36 Thread Grinder. It was rough ground from the solid, hardened, then finish ground.

For complete information and specifications on the Style 36 and other Ex-Cell-O Thread Grinders contact your local representative or write today to Ex-Cell-O.

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A COMPLETE LINE OF PRECISION THREAD GRINDERS

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Precision Thread Grinder—a versatile machine for external work, also available with internal attachment.

STYLE 33
Precision Thread Grinder—a high production machine for external work.

STYLE 39-A
Precision Thread Grinder—a high production machine for internal threads.

STYLE 36
Precision Thread Grinder—a versatile machine for extra long external threads, available with internal attachment.

EX-CELL-O CORPORATION • Detroit 32, Michigan

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

53-35

Washington . . .

Keep your eyes out for the Defense Dept's little-publicized *Cooper Report*, which will be out soon. It could result in an overhaul for Pentagon policy on production equipment and facilities. It's being drafted by a 12-man committee of businessmen, named last year by Defense Secretary Wilson to investigate Pentagon fiscal operations. Charles P Cooper, former AT & T vice president, heads the group.

A special "Industrial Facilities Report" has been prepared by one of the committee's task forces. Details on proposals are still secret. But it's a good bet that they touch on use and disposal of idle military-owned machine tools, the reserve tool program, new equipment procurement, and related matters. Not even Pentagon and ODM production officials know exactly what's in the proposals, but they're expecting something big.

• • •

Vance plan spending by Pentagon has passed another hurdle. The Office of Assistant Secretary for Supply & Logistics has screened the $407 million worth of reserve tool projects drafted by the services. Within a month, it will recommend to Secretary Wilson what tools should be bought with his $100 million reserve tool fund. Officials have just about decided to buy longest lead time tools first—regardless of individual projects. Alternative would be to buy one reserve production line intact at a time. First orders should be placed this fall.

• • •

Defense contractors are taking less metal in fourth quarter—resulting from a tapering-off in aircraft, ammunition, and tank-automotive production. ODM will set aside 12% less steel than in third quarter, 15% less copper, 7% less aluminum for contractors. But by first quarter 1955, officials think the defense take will level off, matching the expected plateau in defense spending.

• • •

ODM has set up a committee of railroad officials to take a closer look at full mobilization requirements for freight cars, passenger equipment, locomotives, tank cars, and shortline equipment. Idea is to revamp the present expansion program. The picture looks strange. According to ODM goals, there's a shortage of 82,000 freight cars, 2000 coaches, 2500 sleeping cars.

But while the government calls for more production, the car builders have been forced to slow down their output. Since January, the car builders' backlog of new orders has dropped from 29,950 to 15,615 cars, employment has been cut about 36%, and five plants have shut down. One indicator of the slump: 60,000 cars are being scrapped this year, but new orders lag badly behind that rate.

• • •

BDSA has blocked a Defense Dept plan to dump on the market several million dollars worth of hand tools bought during the Korean war. The services had declared the equipment surplus. BDSA jumped into the picture before the military could put the tools on the block, contending that the surplus sale would ruin thousands of manufacturers and dealers. Even more effective—and elementary—was BDSA's argument that there are no yearly models of hand tools, so the tools can't really become obsolete.

• • •

The big tax revision bill (see page 158) was supposed to be followed by another so-called "bob-tailed tax bill"—to include a raft of minor tax amendments that were non-controversial. One of these amendments would change the tax on cutting oils from six cents per gallon to three cents per gallon.

First move was to remove the oils from the lubricating oil classification, which would reduce the tax from 6 cents per gallon to 10% ad valorem. Then the industry pushed for a three cents per gallon tax, which would give the government the same amount of revenue as 10%.

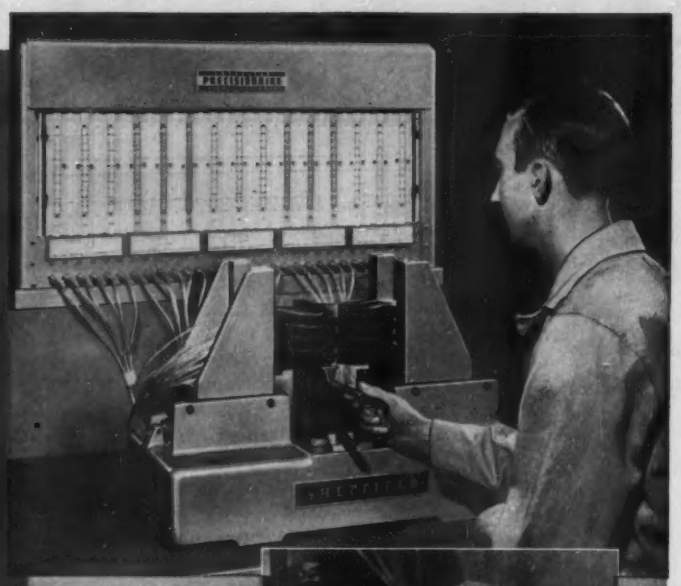
But now Chairman Dan Reed of the tax-writing House Ways and Means Committee has cooled off on the whole idea of another tax bill. Hence, the guessing is that the bill reported out by the Senate won't get written into law when all's said and done.

• • •

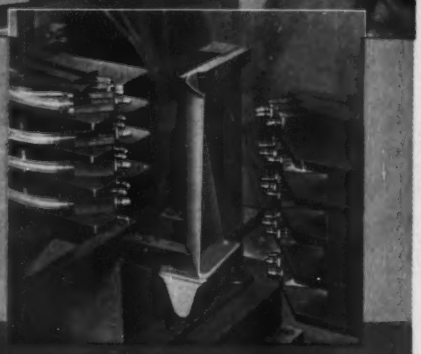
Administration is giving business a "nudge" this quarter by pumping out money and orders at a higher rate than for the rest of fiscal 1955 (see p161). The new policy doesn't mean more spending for the year as a whole. In fact, excessive spending in July-August could mean expenditure cuts later on. This is the way administration economists see it: business is improving under its own steam now. The "nudge" will speed up the rise. Then, when government spending is reduced in later months, business growth will be able to absorb the difference.

Main programs to benefit under the new step-up: (1) highways — federal allocations made six months early; (2) airports; (3) shipping; (4) aircraft — $1 billion worth of contracts will be let this quarter; (5) tanks and troop carriers; (6) Navy — a spurt of contract letting is now under way.

YOU CAN GAGE 40 or MORE DIMENSIONS *As Quickly* AS YOU CAN ONE



Checking 30 points on a jet engine blade



Gaging heads ready to approach the jet engine blade

Spectacular developments in AIR gaging are saving industry millions of dollars and thousands of man-hours. Here's how and why:

1. One operator with one gage can check up to 40 or more dimensions of each work part simultaneously and instantly. The number of parts per hour depends solely on how fast the inspector can handle them.

2. Precision is built into the gage—readings are unaffected by human skill, human judgment and human memory. It's not necessary to memorize and compare readings for individual dimensions—one quick panoramic glance at the float pattern ("Airechart") tells the whole story—the "Float Graph" shows the true condition of every critical dimension.

3. The position of each float shows just where the dimension is within tolerance limits or just how much above or below limit if it is out of tolerance. This is essential for Quality Control.

PHONE, WIRE or WRITE for the full story on how YOU can "produce more and better products at lower cost through practical precision"—in this case, multiple dimension inspection by Precisionaire gaging.

Gage Division—The Sheffield Corporation
Dayton 1, Ohio, U.S.A.

All main bearings of a tractor crankshaft are checked simultaneously

6757

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

Detroit . . .

One of the oldest, hardiest and most entertaining of auto industry rumors is getting a gentle workout again.

The story: One of the auto companies is seriously thinking of going into the aircraft business, to fabricate executive and personal planes.

Periodic revival of this rumor is always exciting, because auto company backgrounds are broad enough to make the story believable. Automakers' experience in fabricating aircraft and aircraft components has been extensive, in wartime and semi-peacetime.

Production knowhow thus is available, as is some of the highest grade sales ability.

A spokesman for the company named in this particular version of the rumor, however, vehemently denies that the company is thinking of building civilian planes.

At present, Meyers Aircraft Co, Tecumseh, is the only firm in Michigan engaged in aircraft production.

• • •

The idle worker total in Michigan is expected to hit 300,000 sometime in September, due to model changeover shutdowns of some Chrysler, Packard, Chevrolet and other auto operations. Present unemployment: about 230,000.

Michigan's Employment Security Commission believes that employment will pick up again during the first week in October. MESC makes no prediction beyond fall; employment after new model introductions will depend on how the 1955 cars sell.

Flint, which has kept its employment levels on a higher plane than any other major Michigan city, noted a slight decline in June, when total employment was 130,000, and unemployment was 4,000—an increase of 800 jobless workers over the May figure. July figures, when compiled, will show a further increase.

• • •

Here's what was behind the CIO Auto Workers Union's decision to recommend a revision of its contract with Studebaker:

Workers have been averaging under 20 hours of work a week, the work force has been cut more than half in the last several months, and Studebaker sales have dropped drastically.

If workers had accepted UAW's recommendations, pay rates would have been substantially reduced (as much as 20% in some cases) by replacing piece work rates with hourly wage rates approximating those elsewhere in the industry, by reducing night shift premium to 10%, 6% for the afternoon shift, 8% for the midnight shift, plus other revisions.

As was the case at Kaiser, and later Willys, after Kaiser bought the Toledo firm, Studebaker's contract was out of line with others in the industry. Additionally, the company's sales have fallen well below 1953's levels (when sales were disappointing, too, following the corporation's failure to get new models before the public when buying fever was highest).

Contrary to expectations of the United International, however, workers turned down this suggestion by a wide margin.

Rejections won't jeopardize the Studebaker-Packard merger, but Studebaker is emerging from its union negotiations with a soiled public relations record.

Announcement of reduction of 20-30% in management salaries is certainly not calculated to draw new management talent to the firm.

Moreover, Paul Hoffman, Studebaker board chairman, was quoted as saying "We're putting the 'generals' back to work, including me."

That, too, was certain to cause workers to wonder what the "generals" have previously been doing to earn their salaries.

The UAW-Studebaker attempt is not the last of auto company efforts to cut back pay scales—at least one other company is in similar negotiation right now.

• • •

An inventory of Ford's Post-World War II expansion shows, to a great extent, the why and how of the company's sales climb:

Since Jan 1, 1946, Ford has spent $1.25 billion of its current $1.6 billion program. For that money, it has so far added 38.5-million sq ft of floor space (which, if under one roof, would form a building 10 miles long and 725 ft wide).

That floor space is split up among 13 new manufacturing plants, 7 new assembly plants, 18 new parts depots and 6 new engineering buildings. Another 20 existing plants have been enlarged or modernized.

During the course of its modernization and expansion effort, Ford has shucked off a collection of properties not related to vehicle production, including several small plants and sites, timber, rubber, farm, commercial, industrial and residential lands, dwellings, stores, an inn and even a golf course.

Announcements to date indicate that the balance of money in the $1.6-billion program will go for construction of three assembly plants, two new proving grounds, an engine plant and stamping plant at Cleveland, two Dearborn office buildings, a manufacturing plant in Ecorse, Mich, a manufacturing research building in Detroit and two more engineering buildings.

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SUPER SENSITIVE VARIABLE SPEED • SMALL HOLE PRECISION drilling machine

SINGLE OR MULTIPLE SPINDLES

to drill holes (.004" to 5/16") in all drillable materials, to the most exacting specifications and on the most relentless production schedules.

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IT'S A **Hamilton Tool**
USE IT WITH CONFIDENCE

Machine Tools . . .

August 16 is the day on which restrictions upon shipments of machine tools to iron curtain countries (except Red China) are to be eased.

This relaxation in the rules may not prove to be as important as anticipated. It certainly is no invitation to the machine tool industries of western Europe and this country to ship tools in wholesale volume to Russia.

• • •

Only the most general-purpose machines have been free from all regulation. Others now removed from the embargo list are subject to "quantitative control," or are on the "watch" list.

Special-purpose machines for defense production are still banned. Most, if not all, elephant tools also are continued on the black list.

For exclusive detailed story on East-West trade, including the items on Russia's shopping list, please turn to page 165.

• • •

The British will benefit immediately from the revision of the strategic list. They have on order some $80 million in metalworking production equipment for shipment to Russia.

British builders have not had much luck up to now in getting export licenses covering these orders. The ban on shipments has blocked them.

Shipments of British machine tools to eastern Europe, in fact, totaled only 116 machines valued at about $1 million in 1953. That is only one-fifth the trade in 1950, when 647 machines valued at $5 million were shipped. By 1952 no British tools at all were being sold to Red China.

In the first six months of this year, British exports of machine tools to Russia and her satellites were insignificant: three threading machines, four presses, two plate and sheet metalworking machines, and three "other" tools to Poland ($112,200); one sheet metalworking machine and 64 miscellaneous machines to Russia ($245,600); and two grinding machines to Roumania ($1840).

Peter Thornycroft, president of the British Board of Trade, has been the foremost advocate of loosening the tight ban on shipments to Russia.

Extensive conversations on the subject were held in London in April between the British and US governments, with later discussions centered in Paris in which the French and other western European countries participated.

Decisive action was postponed during the Geneva conference and during the period of negotiations for an Indo-China truce.

Mr Churchill is reliably reported, however, to have discussed the matter of easing East-West trade during his White House stay early in July.

The easing of trade restrictions gives all the western nations who joined in the voluntary embargo a chance to take some Russian orders legally.

The British may not enjoy their present advantage indefinitely. The Germans and the French will have to be reckoned with too.

The political climate in this country is such that it appears doubtful whether any machine tool builder would wish to risk the storm in Washington that might be kicked up if he booked business for Moscow delivery.

There is no secret about the fact that some German builders have long harbored the desire to sell to the East. Two years ago they would have sold to Red China but not to Russia, except that Washington vetoed the idea.

With partial lifting of the embargo, the Germans are sure to try to move into the Russian trade sphere. Whether they are successful probably will depend largely upon Moscow's views.

• • •

A sizable tooling program for the manufacture of 75 mm shells in Formosa has been stalled for many months, but lately has shown signs of moving off dead center.

The program has been in the hands of the Foreign Operations Administration and a Chinese National Technical Mission in Washington.

FOA would do the financing and the placing of machine tool orders. The Ordnance Equipment Division of the Business and Defense Services Administration has been acting as advisor.

• • •

The British, with an eye on Canada as a rich future market, are investing more and more in machine tool building and distribution there.

Staveley Coal & Iron Co Ltd of England has acquired control of Modern Tool Works Ltd, Toronto. Modern makes lathes, milling machines, drilling machines, high-production precision machines including transfer-type equipment, dies, jigs, fixtures and special gages.

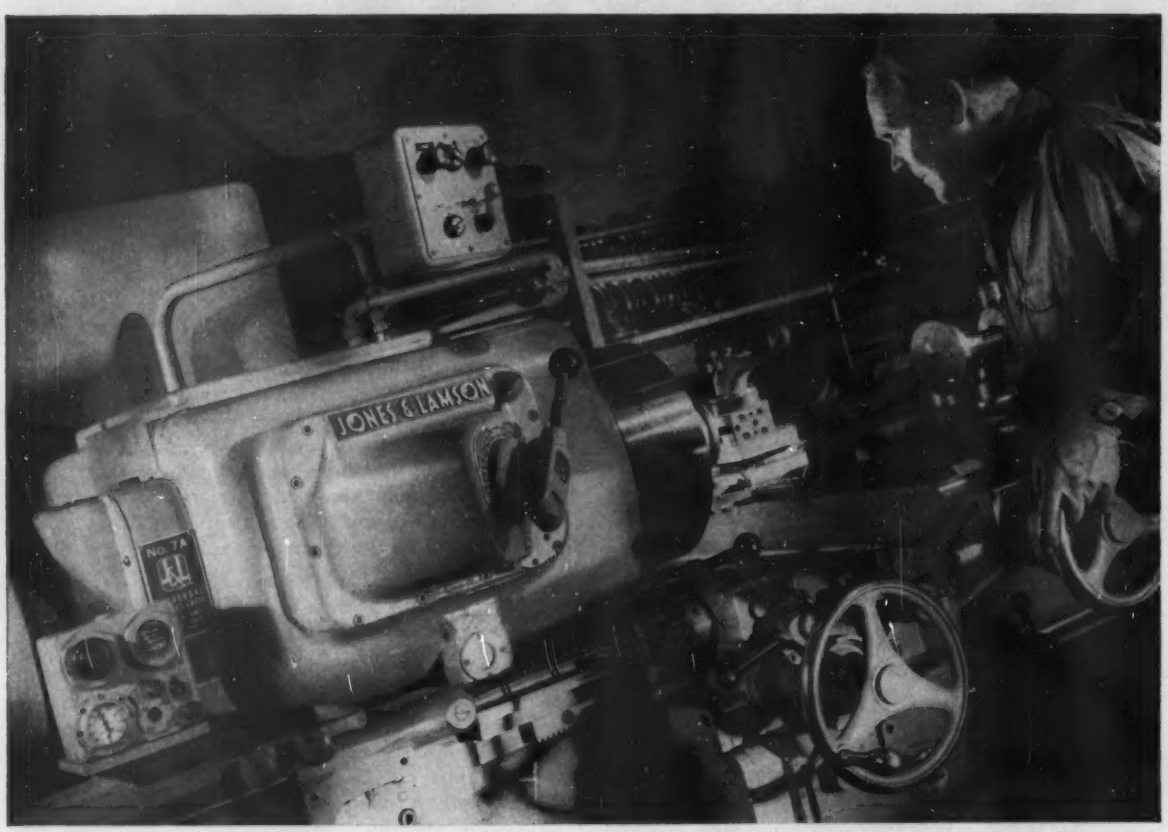
Staveley also controls Standard Machine & Tool Co Ltd, Windsor, Ont, which now will shelve its plans for a new plant in the Preston area. Instead it will erect a new factory in Windsor.

James Archdale & Co Ltd and George Richards Co Ltd, well-known British machine tool builders, are owned by Staveley, the management of which says that there will be full collaboration and exchange of technical data between the British and Canadian companies.

This cooperation will extend to high-production machinery suitable for the automotive and allied industries in Canada and the United States.

BF

TO LEASE OR NOT TO



Jones & Lamson Now Offers a 3-Way Marketing Service that Establishes Top Industry Standards for Sound Practice in Meeting the Variable Needs of Industry.

In developing the provisions of its new vertical-coverage marketing service for machine tool users, Jones & Lamson has drawn upon the most extensive background of production and marketing experience in the industry.

Jones & Lamson's 3-way Marketing Plan is outlined at right, with a brief review of each method.

The Lease Situation Today

The general leasing of capital equipment is relatively new. Despite the publicity and recent impetus it has received, only a small proportion of all privately operated plant equipment is now under lease.

Leasing is not yet general enough to be standardized. There are almost as many forms of contracts as there are clauses. Nevertheless, there will always be a sound basis for the leasing method in our rapidly expanding industrial economy.

Because of these conditions, the tax and legal aspects of many types of rental contracts were studied by Jones & Lamson's marketing division to produce a sound leasing plan that provides the maximum advantage and flexibility for the user.

Says Jones & Lamson's Manager of Marketing, H. A. Finch, "The best contract a customer can have is still the knowledge and integrity of the supplier. This is especially true in the matter of leasing."

LEASE

JONES & LAMSON'S 3-WAY MARKETING SERVICE

To further facilitate the expansion of American productivity and markets, Jones & Lamson now offers *three* plans for the procurement of machine tools.

They are designed to accommodate the widest possible variety of industrial needs, and to establish top industry standards for sound practice.

Outright Purchase

The outright purchase of capital equipment is generally preferred. It offers the obvious advantages to the user of lower cost, freedom of operation, and full profit from the use of the equipment.

"Pay-from-Productivity" Plan

Plans are also offered for those who prefer making payments from the additional savings created by the use of new and modern machine tools, and on terms more favorable than can be obtained from most credit sources.

Payments may be made on a one to five year basis, in equal monthly installments, with a small down payment and a charge at the rate of 3.25 percent on the original unpaid balance.

(Payment Analysis per $1,000. Sixty Monthly Payments)

	Remaining Principal	Total Payment During Year	Total Cumulative Payments
Payment at Shipment	—	—	250.00
End of 1st year	600.00	190.89	440.89
End of 2nd year	450.00	181.89	622.78
End of 3rd year	300.00	172.89	795.67
End of 4th year	150.00	163.89	959.56
End of 5th year	None	154.89	1,114.45

The Lease Plan

Leasing may be advantageous when working capital is inadequate for necessary plant modernization or expansion, and when alternative uses of capital are more pressing or more profitable.

Under the Jones & Lamson plan, the customer gets the normal 1 year guarantee, and he may offer to buy the machine at the end of any year, at the then existing fair market value or at a predetermined option price.

To provide maximum flexibility, the plan is available in four variations, the principal differences being in the annual rental and return charges. With each plan, a 10 percent deposit is required, to be refunded to customers upon fulfillment of transaction. The minimum payment plan is shown below.

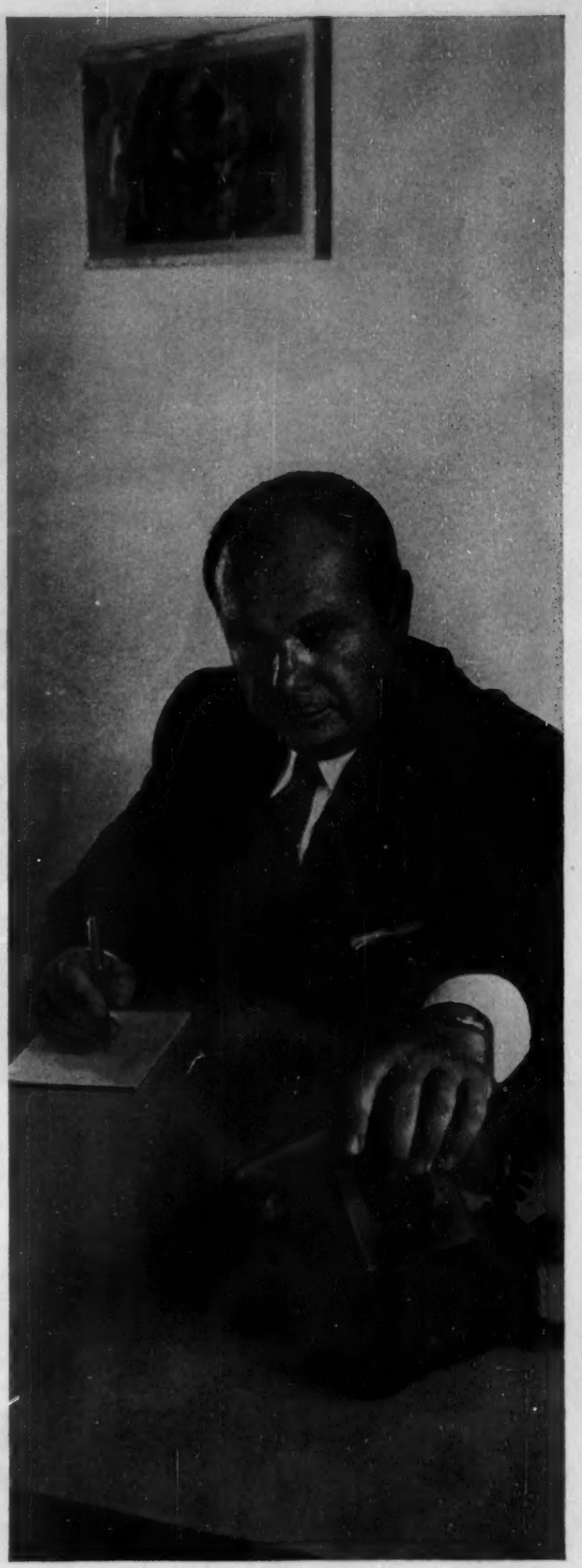
(Annual Rental per $1,000 Selling Price)

Year	Rent	Return Charge	Year	Rent	Return Charge
1st	$180	$500	6th	$180	None
2nd	180	360	7th	60	None
3rd	180	240	8th	60	None
4th	180	120	9th	60	None
5th	180	None			

JONES & LAMSON MACHINE COMPANY

502 Clinton St., Springfield, Vermont, U. S. A.

Turret Lathes—Fay Lathes—Thread & Form Grinders—Optical Comparators—Threading Dies



"LONGER TOOL LIFE, BETTER FINISH . . ."

says Philip Rosenberg, President, Howard Industries, Inc., Buffalo, N. Y.

Mr. Rosenberg is talking about *Texaco Cleartex Oil*, used for years as cutting coolant and machine lubricant in a battery of Acme Gridleys producing parts for automotive engines and steering mechanisms. Steel worked ranges from C1016 to 4130. He goes on:

"Texaco Cleartex Oil *has given us complete satisfaction. We get longer tool life, better finish, and our machines are still operating with the original factory bearings. We are glad to recommend* Texaco Cleartex Oil *for similar operations.*"

Texaco Cleartex Oil is just one of the complete line of *Texaco Cutting, Grinding, and Soluble Oils* designed to help you do all your machining better, faster and at lower cost.

A Texaco Lubrication Engineer will gladly help you make the proper selection and improve the machining in your plant. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

Gaging Metalworking . . .

PRODUCTION INDEX
BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JULY '54(*)	JUNE '54(p)	MAY '54(r)	JUNE '53
Tot. Index...	**144**	**146**	**147**	**168**
Machinery	**124**	**124**	**144**	
Electrical Machinery	**168**	**163**	**194**	
Autos	**104**	**106**	**131**	
Other Transportation	**286**	**296**	**288**	
Other Metalworking	**125**	**124**	**142**	

(*) Estimated (p) preliminary (r) revised

The metalworking industries are pinning their hopes upon a fall pickup and are confident that they will not be disappointed.

The summer has been remarkably good, despite vacation shutdowns which sometimes have been conveniently prolonged for a week or two because of slim order books.

• • •

There are good signs on the road ahead. One is the survey made by the Survey Research Center of the University of Michigan showing that consumers are in a mood to spend more money on automobiles and other durable goods.

The survey flatly concludes that "businessmen have every reason to believe that their sales efforts will meet with favorable reactions on the part of consumers."

• • •

Prospects of increased defense spending also loom. While there will not be any new spurt, the present volume will be sustained and perhaps enlarged to some extent.

The electrical appliance people and TV set producers are beginning to make new models and are proving to be a boom to independent stamping shops. Stamping business from these two sources had been light the first half of 1954.

The construction industry is another fertile source of orders for metal products. It should continue to be very active all year.

• • •

The automobile industry momentarily is the biggest drag on Metalworking. It is in the midst of its longest retooling period since before World War II. And that means curtailed deliveries by parts and materials suppliers.

Major auto parts companies, however, have received first releases for new-model manufacture and some work already has been turned out against these orders. The releases will grow in volume as the weeks roll by.

Parts makers are looking more closely at the components they buy outside with an eye on fabricating more of them in their own plants.

Stamping shops are operating 38-39 hours a week, compared with 47 hours a year ago. Most plants are running a single shift, with some working a seven-hour day. The hours worked will drop temporarily as the full impact of automotive curtailment is felt.

• • •

Steel mills are writing off August as another June and July. Extensive shutdowns in the automotive industry preparatory to new-model production have cut deeply into steel demand and account in part for the dull market.

Apathy exists also in merchant wire products as a result of buying resistance by farmers.

Some increase in volume is expected by steel makers in September, with a further gain in October.

• • •

Considerable optimism is discernible about late fall and winter business, mainly because users' stocks are close to rock bottom.

This optimism is reflected in freer purchases of scrap. But curtailment of ore shipments at this early date hardly augurs a boom in steel during the winter months.

Steel warehouse sales are off about 30% from last year; and jobbers are unhappy about current business. Nevertheless they are taking steel from mills at a good rate.

Gaging Business . . .

PRICE INDEX

	JULY '54(*)	JUNE '54(p)	MAY '54(r)	JUNE '53
Total Index	**132.4**	**132.4**	**132.4**	**130.9**
Metalworking Machinery	**141.6**	**141.6**	**140.2**	
Other Machinery exc. Electrical	**137.5**	**137.5**	**135.0**	
Electrical Machinery	**131.1**	**130.1**	**129.3**	
Fabricated Metal Products	**128.8**	**128.7**	**127.8**	

(*) Estimated (p) preliminary (r) revised

Cost of living inched up 0.1% in June to 115.1% of the 1947-1949 average. This index has ranged within 0.5% in the last year.

While cost of living will probably be as steady for the rest of the year, food prices will fluctuate more than the total index.

• • •

At any rate, consumers feel a lot better about economic conditions now than they did last fall.

For one thing, they aren't anticipating further cuts in their income. And they plan to buy more durable goods than they did at the end of 1953. This was reported by a University of Michigan survey made for McGraw-Hill.

• • •

Total industrial output, after seasonal adjustment, was probably off a couple of points in July. And it may stay at the same level this month because of the summer lull.

It now looks like industry won't get the lift it was looking for this month — nor in the next few months.

The reason: manufacturers' backlogs are being cut down to just-before-Korea levels.

• • •

Durable goods producers' unfilled orders currently represent less than four months' work at present shipment rates. This compares with nearly 6.5 months' work in September 1952, and only 2.5 months in June 1950.

• • •

Housing starts in June rose to 120,000 — a 12% increase over May. Usually, the number of starts in June is lower than in May.

Total units started in the first six months of 1954 has been revised to 575,000 units — 6600 units fewer than in 1953.

The difference is because of a decline in public housing units.

• • •

Auto manufacturers expect output of passenger cars to hit 5.5 million units this year.

But this includes nearly a million 1955 models to be turned out in last quarter 1954.

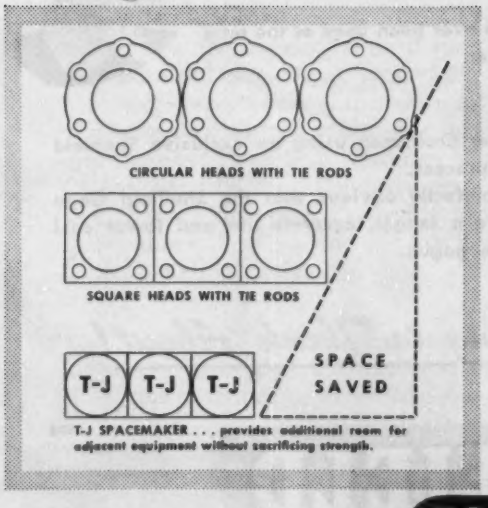
WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49 = 100)*	125.5	126.2	136.1
Steel ingot production (thousand tons)	1,544	1,532	2,119
Electric power output (million Kilowatt hours)	9,139	9,103	8,512
Production of automobiles and trucks	130,917	130,744	168,267
Engineering construction awards (*Eng. News-Record*, millions)	$368.6	$262.3	$326.5

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	290	282	343
Vacuum cleaners sales (thousands of units)	196	202	159
Washers sales (thousands of units)	303	247	305
Household electric ranges sales (thousands of units)	88	83	113
Radio production (thousands of units)	720	722	1,164
Television production (thousands of units)	405	396	524
Gear sales index (1947-49 = 100)	127.4	134.3	146.5
Foundry equipment new orders index (shipments, 1947-49 = 100)	n.a.	125.3	156.4

* Seasonally adjusted
n.a. not available



T-J Spacemaker CYLINDERS

OIL pressure to 750 — AIR to 200 P. S. I.

Now the sensational new T-J Spacemaker sets the pace in compact cylinder design and efficient performance!

New "Self-Aligning" adjustable oil cushion means faster acceleration and better cushion than ever before . . . New T-J Super Cushion Flexible Seals for air insure positive cushion with automatic valve action for fast return stroke.

More plus features include—heavy wall, precision honed, hard chrome plated, seamless steel body . . . leakproof cylinder head to body construction . . . heavy duty, high-tensile, *hard chrome plated piston rod.* Write for bulletin SM-454-2. The Tomkins-Johnson Co., Jackson, Mich.

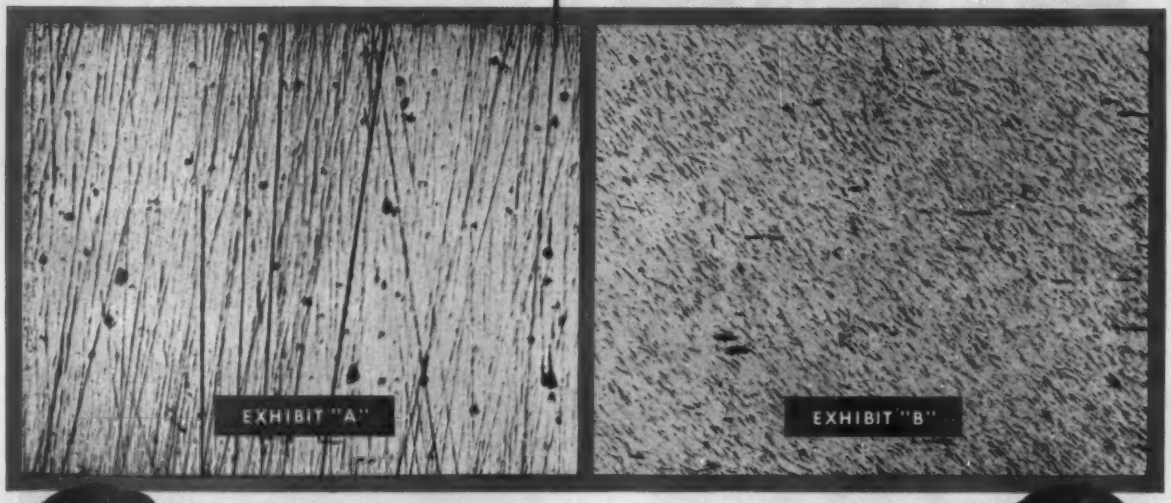
T-J TOMKINS-JOHNSON
RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

LITTLE KNOWN FACTS

about the NATURE of GAGES

Scientific research has brought to light facts about *Fixed Size Gages* that will benefit all of us who come into close contact with them—especially those who pay good money for them.

The two illustrations "Exhibit A" and "Exhibit B" are unretouched photomicrographs of lapped gage surfaces straight from The Detroit Testing Laboratory, Magnification X100 in both cases—Project 4726-C-12.



COMPLEXION—Harsh or Lovely

Notice the deep lines and wrinkles that characterize "Exhibit A." A definite indication of improper "Skin-Care."

Contrast that with the smooth even texture and youthful appearance of "Exhibit B." A skin that invites your touch.

Both gages are the same age and neither had ever been used at the time they were photographed. No favoritism whatever.

CONCLUSION

The ridges between the furrows in "A" will wear down quickly when that gage is put into service. Result: Rapid initial wear—Short accurate life—High cost per part gaged.

"B" is a SHEFFIELD GAGE, painstakingly finished by Master Craftsmen using an exclusive Sheffield lapping process.

It is perfectly obvious that the Sheffield Gage will have a longer, accurate life and lower cost per piece gaged.

Gage Division—The Sheffield Corporation
Dayton 1, Ohio, U.S.A.

Something to Think About!

6808

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION * ESTABLISHED 1877

Better Adapt Yourself—or Give Up

Free competition, governed only by rules of fairness. That is the heart of our American economy. Manufacturers do not walk arm in arm, fixing price ceilings, production quotas, and a comfortable status quo.

Thus Henry Ford II told a group of West German economists and government officials recently. He stressed the fact that free competition is a "tough game." You either adapt yourself to it or give up.

There is ample evidence in the news from Metalworking these days that plenty of companies are adapting themselves to the situation looming ahead and are not satisfied with a comfortable status quo.

Square D Co is to have a new heavy equipment manufacturing plant with the most modern production techniques. Steel Improvement & Forge Co has bought Champion Forge Division of Champion Industries Inc, thus enabling the former to forge components for the aviation industry in a much wider range of sizes.

Brush Electronics Co, division of Clevite Corp, has purchased the Digital Instrument Co, maker of electronic counters, continuing its expansion into the electronics field. Wellman Engineering Co has acquired the locomotive crane division and plant of Browning Crane & Shovel Co. In this manner it will round out its line of materials-handling equipment.

General Electric has a new factory for mass producing power transformers. It expects to reduce by more than one-third the production cycle, with most of the savings being made in mechanized handling of materials and parts. Westinghouse is planning a new plant to make smaller sizes of fractional horsepower motors which cannot be produced competitively in present facilities.

Timken Roller Bearing Co is spending $3.5 million on expansion at its Bucyrus plant. Part of the money is going for new heat-treating furnaces and for screw machines for a new cone production line. Republic Steel has added to its holdings eight plants of the Cleveland Chain & Mfg Co which make a full line of chain products. It thus inches farther into the fabricating field.

These are merely a handful of examples of what metalworking companies are doing to strengthen their positions, to reduce their costs, and to expand and consolidate their operations. We could have cited a hundred other companies that are doing the same sort of things for the same reasons.

These manufacturers recognize that competition is keener, selling is getting harder, and the job of keeping the shop filled with orders is no swivel-chair assignment. More than that, the task of making a profit is more formidable than it was.

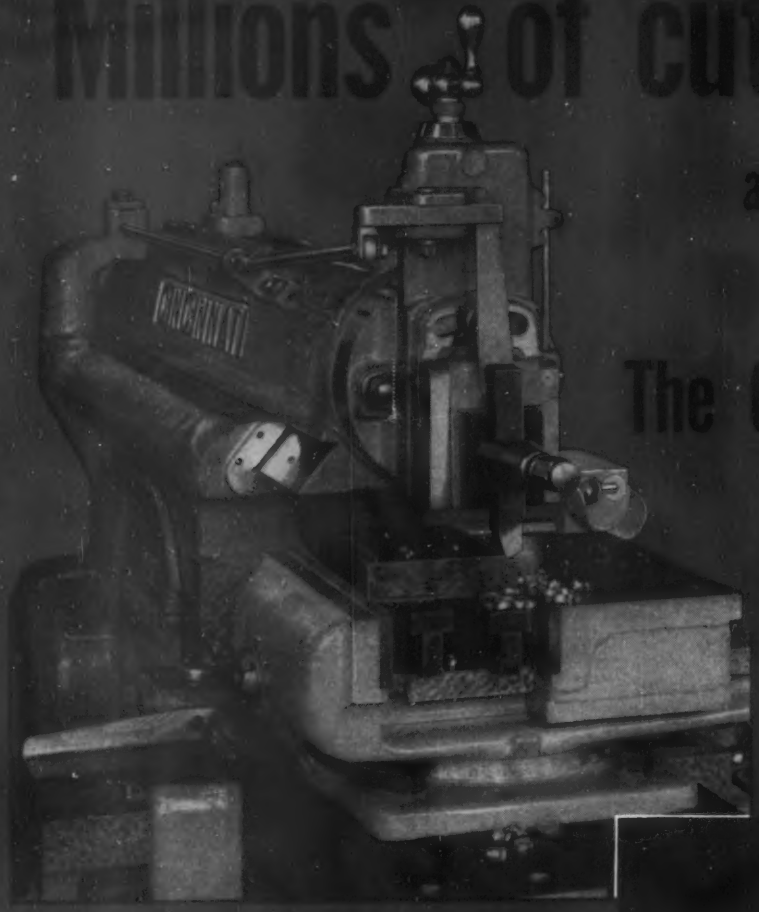
The point is that it is no time to sit back and let well enough alone. Your fellow manufacturers are on the move. And you have got to stay right up there with them or lose ground.

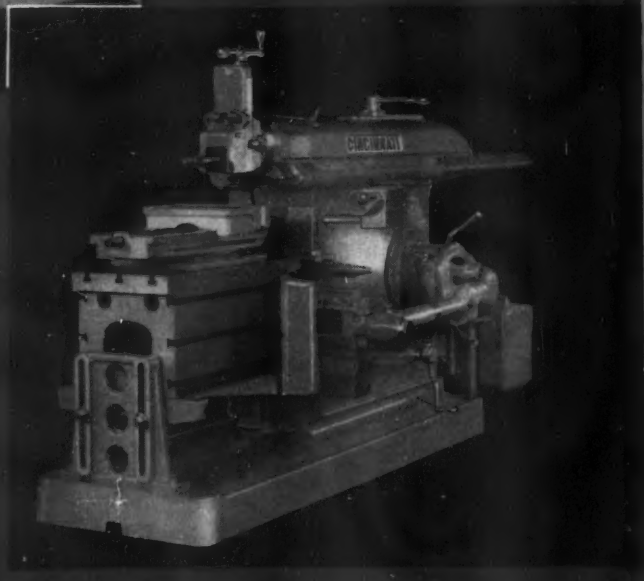
Free competition today, indeed, is a tough game, as Mr Ford told the Germans. You had better adapt yourself to it. The only alternative, as he warned, is to give up.

Burnham Finney

Millions of cuts without a fault...

The CINCINNATI Tool Lifter!





The dependable Cincinnati Tool lifter, with positive return and lift, eliminates tool damage—operates at high speeds—and with angular settings of tool slide or clapper box. Protects and permits use to maximum advantage of carbide or high speed cutting tools.

After simple setting it is automatic, relieves operator and increases production.

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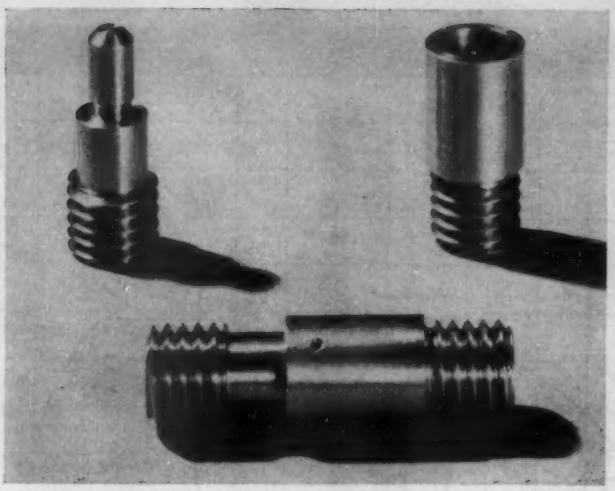


FURNACE-BRAZED TEST PIECES are designed for concentric and axial tensile loading. Average tensile shear data obtained from these specimens indicated an average strength of 43,000 psi. All failures occurred in parent metal outside the brazed joint

Now titanium can be furnace-brazed

Previous reports on torch and induction brazing of titanium indicate the need for silver or silver-base alloys which do not permit furnace brazing because of short time cycle. Recent developments, however, show that this production method of joining titanium is practical with nickel-base and titanium-base alloys. Here is how it is done

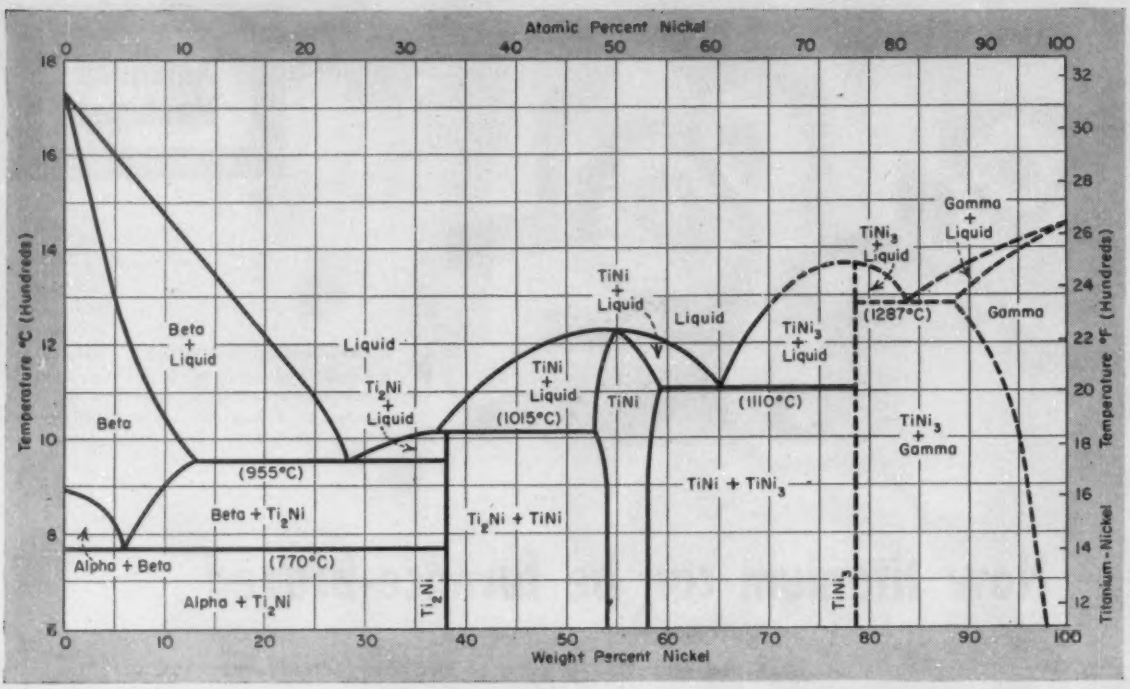
R A LONG, manager, Aircraft Components Div. FERROTHERM CO., CLEVELAND, OHIO

Joining titanium to titanium and to mild and stainless steels presents one of the biggest production problems in the use of this vital material. Although mechanical joining is widely used, it is not practical in all instances; and welding, although successful in many cases, produces a high percentage of scrap. This is largely a result of the difficulty of eliminating absorption of hydrogen, oxygen, and nitrogen which produces extreme brittleness at the joint and occurs even when welding with protective atmospheres. The higher the temperature the greater is the tendency for this absorption to occur, and, of course, welding requires melting temperatures at the joint. In the case of titanium this is about 3,100 F.

Considerable effort has been made to develop successful brazing techniques where much lower temperatures are required. Brazing is used both as an alternate procedure to welding and in cases of many parts, as a replacement to minimize distortion. Most of the work done thus far, however, requires the use of silver or silver-base alloys which require minimum time cycles to avoid the formation of brittle intermetallic layers. These layers, or bands, form as the diffusion of one element into another progresses, then create planes of weakness that cause low joint strength and low ductility. As the rate of diffusion is a function of time and temperature, the quicker it is accomplished the less opportunity there is for the formation of these brittle bands. For this reason, silver brazing alloys, fluxes, and induction heating have been most successful because diffusion rates can be minimized by these means. Brazing temperatures are low and the material can be heated in a matter of a minute or so. Unfortunately, silver alloys do not permit the advantages of furnace brazing for high-volume production because the time cycle required is far too short to be practical.

NEW ALLOYS

In addition to production economies, furnace brazing combines the low temperatures of torch or induction brazing with the protective gas atmospheres of welding so the best features of both joining methods are obtained. To gain these advantages it became necessary to find a brazing alloy that was not dependent upon time for bonding and which had a flow temperature within the metallurgical limitations of the base metal,



NEW FURNACE BRAZING ALLOYS were selected from this nickel-titanium phase diagram because other alloy systems were limited by excessively high melting temperatures or their combined elements were not strong enough. Here two eutectics are indicated, one with approximately 66% nickel which melts at 2030F and the other with 28% nickel which melts at 1750F. Adding titanium to either rapidly increases liquidus temperature, indicating possibility of furnace brazing without too much "washing" or erosion between brazing filler and parent metals

titanium. For this reason, a "fusion" brazing alloy was developed instead of a "diffusion" alloy, with the result that alloying of the brazing material with the base metal takes place at the interfaces by fusion. Fusion alloying tends to eliminate the formation of intermetallic layers and the resulting planes of weakness at the interfaces. Any intermetallic phases that are formed would be distributed throughout the joint area and may actually act as joint strengtheners.

By employing an inert-gas protective atmosphere instead of fluxes as in torch or induction brazing, the furnace method further reduces the absorption of hydrogen and nitrogen at the joint. The protective atmosphere is most important because of the affinity of titanium for oxygen, nitrogen and hydrogen.

As in conventional practice, the brazing filler alloy must meet the following requirements:

1. It must melt and flow freely at some temperature below the melting point of the parent metals being joined.

2. It must alloy with the parent base metal by either fusion or diffusion without formation of undesirable brittle phases.

3. Alloy phases formed at the interface must have properties of strength and ductility equivalent to the minimum required for any particular application.

4. Washing, or erosion between the brazing filler metal and the parent metal must be controllable within the limits required for the brazing operation.

5. Temperatures required for braze filler metal flow and to which the parent metals are subjected may not be so high that detrimental structural changes will occur with resulting low mechanical properties.

6. Alloying elements of the braze filler metal must have low volitalization characteristics at the brazing temperatures required.

7. It must alloy or combine with the parent metal and, if possible, result in an alloy with a higher melting temperature than before.

In addition to these basic requirements, the alloy system selected had to be compatible with titanium, and be self-fluxing as far as the oxides and nitrides of titanium are concerned.

A nickel-titanium system appeared to meet these requirements, and two alloys were selected in which additions of base-metal titanium created an increase in liquidus temperature, indicating the possibility of brazing without too much "washing" effect. One of these is a 66% nickel-titanium alloy, the other a 28% nickel-titanium alloy. A standard wire-resistance tube muffle furnace with tank argon, properly cleansed, was used with these alloys for brazing commercially pure titanium. Altogether, 15 different alloy combinations showed promise but, to date, two have been at least partially evaluated. The nickel-base (66% Ni) alloy has been designated A 7a of an A series while the titanium-base alloy (28% Ni) has been designed B series. The other

alloys have only been evaluated as to wettability and the effects of time and temperature on flow characteristics.

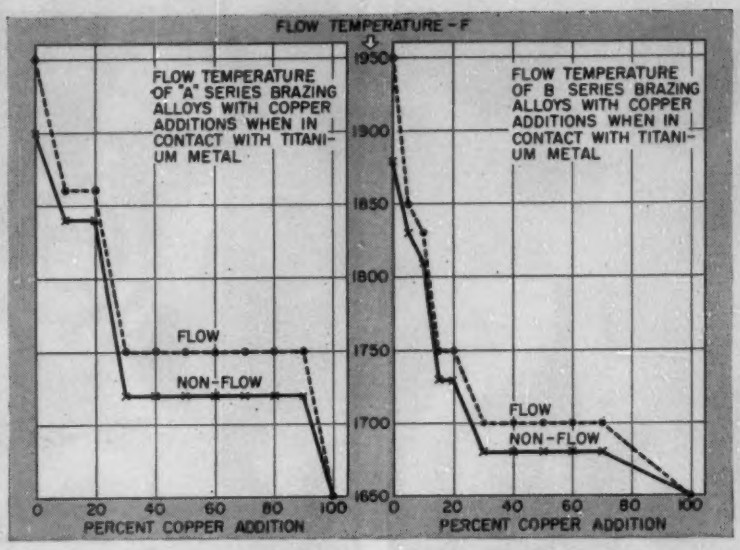
REDUCED BRAZING TEMPERATURES

As a result of tests, a maximum furnace temperature of 1.950F was indicated and time periods up to 30 min were found to be permissible. Wettability of a brazing alloy is dependent upon base metal, brazing-alloy composition, and temperature. A temperature increase is the most effective means of increasing wettability, but as it is necessary to limit maximum flow temperatures, this could not be used. Instead it was decided to revise the brazing filler-alloy composition. Additions up to 30% copper were found to be the most expedient means of lowering the flow temperature of the base eutectics. Although 30% additions of copper lowered the flow temperature to about 1750F, this much copper was felt to be detrimental to the mechanical properties of the brazed joint because of its known embrittlement characteristics with titanium. However, addition up to 15% were found to be satisfactory. Additions of cobalt, chromium, and manganese supplement the addition of copper and, in some cases, permit less of it to be used to obtain equivalent flow temperatures.

In fusion-alloy brazing there is a wide fusion zone across which hardness can vary considerably, depending upon gap clearances and time-temperature variations, therefore it is important to balance the elements employed in a braze filler metal to minimize this hardness gradient. When the hardness of the joint from parent metal to parent metal is kept uniform or, at least reasonably so, a better joint is obtained. In furnace brazing with the nickel-titanium alloys, interface hardness after complete alloying varies between R_c 25 and 36 depending on the other alloy additions. Commercially pure titanium (RC 70) has a hardness between R_c 18 and 23. Therefore a reasonable gradient can be realized.

GOOD STRENGTH CHARACTERISTICS

In brazing RC 70 titanium with the 66% Ni (A 7a) average compressive shear strength is 59,300 psi, the shear area being calculated on a dia of 0.532 in. and a width of 0.144 in. Failure occurred within the braze joint. Tensile shear data averaged about 43,000 psi. Here the shear area was calculated on a dia of 0.395 and a shear length of 0.60 to 0.81 in. These failures occurred in the parent metal outside the braze joint. Compressive shear data on the 28% Ni alloy (B 4) averaged approximately 37,500 psi and failure occurred in the joint.



ADDING COPPER to (A series) titanium-base alloy (B series) and nickel-base alloy lowers flow temperature but high percentages are detrimental to mechanical properties of brazed joint. Copper in amounts of 5 to 15% satisfactorily lowered temperature without weakening joint. Supplemental additions of other elements, chromium, cobalt, manganese, either separately or in combination, also aid in lowering flow temperatures and permit use of less copper

FURNACE-BRAZED JOINT in this photomicrograph indicates fusion of RC 70 titanium parent metal with nickel-titanium alloy filler metal. Brazing alloy contained additions of 15% copper, 5% cobalt. Structure is acicular, or coarse alpha, and is typical of those obtained with the high-nickel brazing alloy. Fusion area is about 0.015 in wide, the original clearance 0.002 in. Restriction to a narrow width is advantageous in joining thin sheets where the fusion zone could amount to a high percentage of total gage thickness

Although current work with furnace brazing in this plant has been done primarily with commercially pure titanium, no difficulty is anticipated with alloy titanium except possibly in controlling the rate of cooling to insure adequate transformation from beta to alpha.

Another application for these newly developed alloys is the fabrication of wire for Heliarc fusion welding, in which the alloy in wire form will be the filler rod.

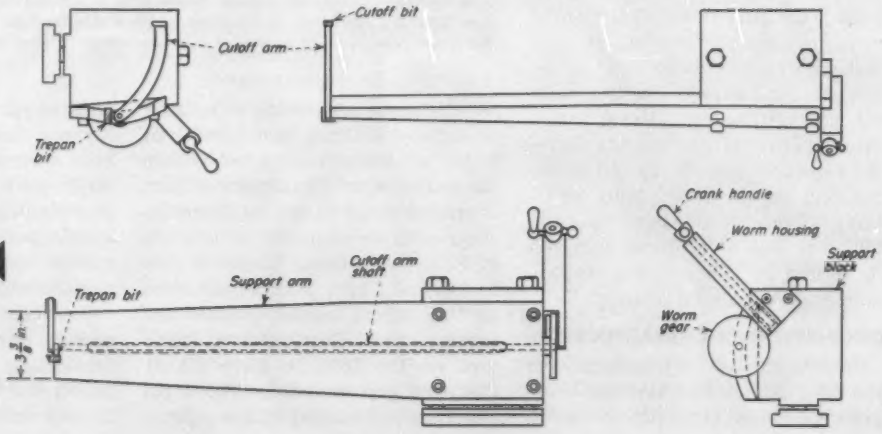
SPECIAL TOOL is designed with trepanning bit projecting ⅛ in. beyond cut-off arm. Bit has 5° positive top rake and 7° front clearance. Cut-off bit, also carbide, is 5/16-in. wide and projects radially ⅛ in. Latter bit is manipulated through worm gear and shaft from lathe compound

TREPANNING CUT is started at full feed of 0.005 to 0.007 in. per rev and a surface speed of 500 sfpm. Note that only the trepanning bit is cutting; parting tool rides clear of work

Trepan bottoming holes in one operation

Trepanning produces a usable core of material as the tool progresses through the work. On bottoming holes, the trick is to separate the core from the work; through holes are no problem. Here, to produce crucibles, is a combination trepan and cutoff tool that parts the core and leaves a clean hole bottom

R W HOLMES, mechanical engineer ARGONNE NATIONAL LABORATORY, LEMONT, ILL



TOOL DESIGN shows arrangement of mounting block, shank, parting drive, and parting arm, as well as bit locations. This device replaces two operations with single-purpose tools that formerly were required to complete the crucible

PARTING OF CORE is accomplished by hand-feeding the tool according to "feel" of operator. Bit takes a 5/16-in.-wide cut; then trepanning bit is run across the bottom to clean up surface. Flexible hoses carry away powdered graphite

A considerable saving of valuable material is made possible by the use of trepanning to manufacture the many graphite crucibles used at Argonne National Laboratory. Formerly, all of the graphite in the hole was machined away as powder; now only a narrow annular groove is machined and the remaining core can be used for a crucible of smaller size or for some other application. Trepanning a bottoming hole is only practical when it is possible to part the core at the bottom. This operation is accomplished with a tool designed by Alexander A. Denst, foreman of the laboratory's Central Shops.

This tool performs two operations without retracting it from the hole. First, it is advanced into the large solid cylinder of graphite to separate the core from the wall; then it parts the core from the bottom of the crucible, leaving a smooth, flat surface. Until this multi-purpose tool was developed, the job was done in two operations with single-purpose tools (*AM*—Nov 10 '52, p 122). The new tool accommodates the narrow range of sizes used in the laboratory's operations. To produce crucibles of other sizes, the length and curvature of the shank and arm must be varied.

In operation, a long, tapered, and curved steel shank (cut from a piece of pipe) is mounted in a block on the lathe compound and supports the brazed-in carbide cutting tip which cuts the annular groove longitudinally into the graphite cylinder. When the desired depth is reached, a second cutting tip, mounted on an arm at the end of the shank, is rotated toward the center of the cylinder by means of a worm gear, thereby parting the core from the bottom. The parting tool is hand fed until about one inch of stock remains uncut. Then the core is broken off with a mallet. The latter practice has proved safer than separating the core while the work is rotating. After removing the core, the trepanning cutter is fed across the bottom to create a smooth finish. HSS cutters would be satisfactory for limited production but we use carbide for convenience and longer tool life.

In contrast to the machining problems with other materials, the major limitations to feed and speed in this operation are the holding power of the chuck and the brittleness of the graphite.

$$ from diamond sludge

Diamond salvage from swarf and sludge of diamond grinding has increased from 685,000 carats in 1950 to about a million carats last year. There's still room for improvement, though. Estimates of potential recoverable volume range from 1½ to 3 million carats a year.

To help make recovery more efficient, here are a few rules that will help both you and the salvage specialists with whom you work:

§ Swarf should usually have at least 3 carats per lb to be worth recovering.

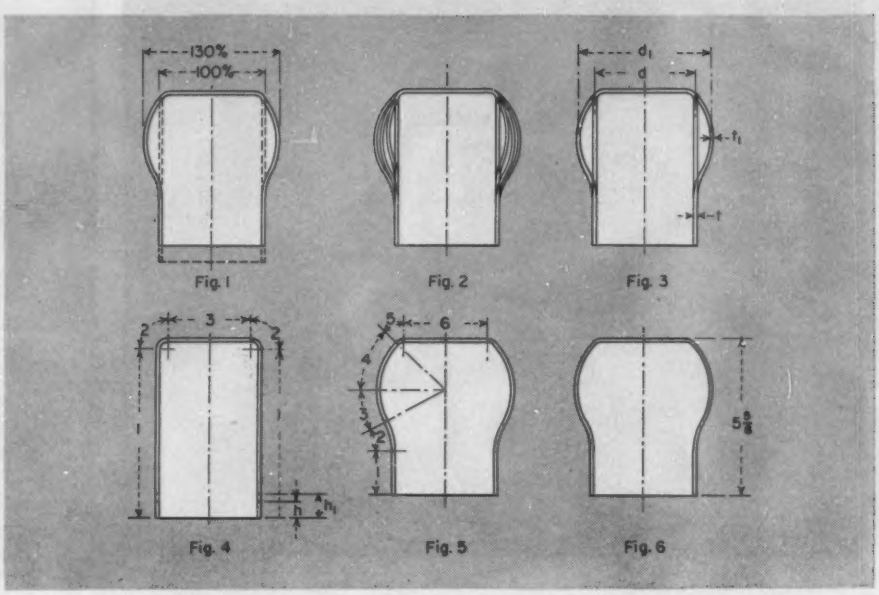
§ Swarf or sludge should be supplied in large quantities (25 to 100 lb) so the best technique for that batch can be found from a small sample, and that technique applied to the whole batch.

§ For dry grinding, a dust collector will catch swarf. For wet grinding, simply tie a cloth bag over the end of the coolant pipe from the grinder. In either case, keep diamond sludge separate from all other kinds of grinding residue.

§ If you know the source and impurities in the material being salvaged, it'll help make salvage more efficient.

§ Resinoid-bond wheels usually have high percentage of recoverable diamond, because of relatively faster wheel wear. Other bonds may, however, give a recoverable diamond content.

The economies of diamond salvage are obvious, but there is an even more important gain — the diamonds thus saved are a significant domestic source of this valuable industrial material. (Abstracted from Report No. MMAB-55-C, Conservation of Industrial Diamonds, Mat'l Research Council)



FIGS. 1 to 6 . . . Bulging may require more than one operation because the limit is 30% of the shell diameter per step. Some of the bulge is obtained by stretching the metal, a part is drawn from the open end of the shell

Cope Talks on Draw Dies . . . XVII

Choose from 4 methods to bulge shells

STANLEY R COPE, president, ACME SCHOOL OF DIE DESIGN ENGINEERING, SOUTH BEND 1, INDIANA

In the manufacture of kitchenware, such as pitchers, kettles, pots, pans, and other containers, it is often necessary to bulge or expand the walls of shells to bring them to their final shape. The diameter of plain cylindrical shells, which have been drawn from steel, brass, copper, aluminum, or silver, can be increased as much as 30% in one operation, provided that shell is carefully annealed before bulging (Fig. 1).

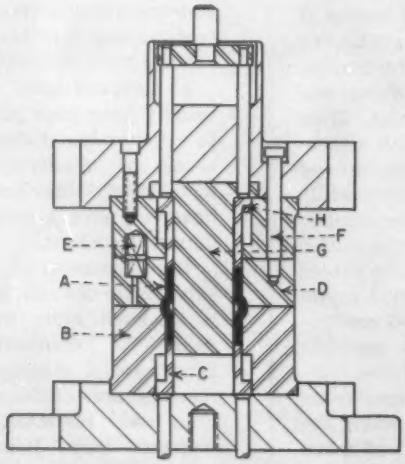


FIG. 7 . . . A small bead can be made in a thick-walled shell by applying pressure on the end. Plug G prevents inward collapse of the metal

If the total increase in diameter of the bulged portion of a shell is greater than 30% of the diameter of the cylindrical body, two or more operations, with intermediate annealings, may be necessary. The shell may be bulged complete in one die, with different settings (Fig. 2).

The diameter to which a shell can be bulged, even if more than one operation is used, is limited because of the natural decrease in metal thickness which takes place during a bulging action. When a plain cylindrical shell is bulged, only a portion of the metal in the bulge is drawn from the open end of the shell. The remaining increase in the area between the plain and the bulged portions of the shell is a result of stretching (Fig. 3).

Metal thickness at the bulged portion of a shell can be found with the formula:

$$t_1 = t\sqrt{d/d_1}$$

where: t is the original stock thickness.

t_1 is the thickness at bulged section

d is the mean diameter of the plain shell before bulging

d_1 is the mean diameter of the shell after bulging.

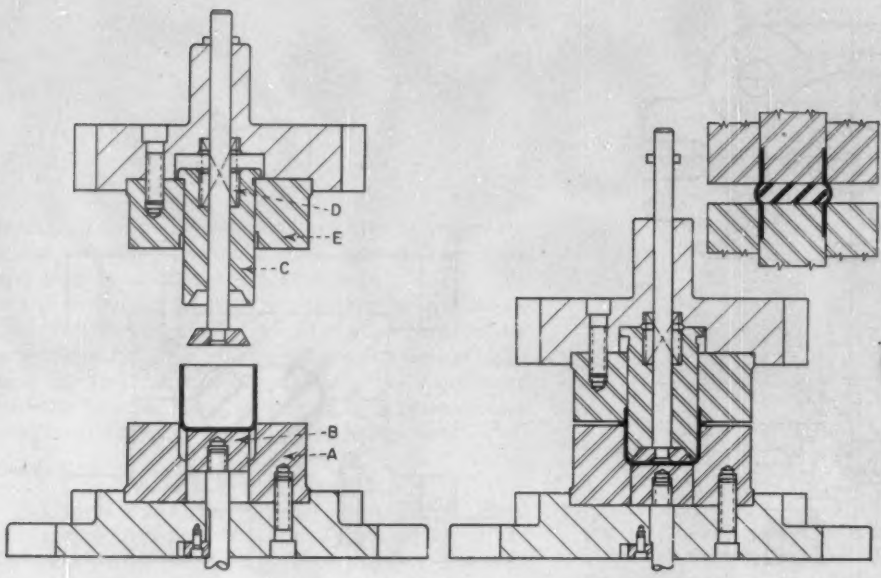


FIG. 8 . . . A rim is formed by bulging a bead outward, then flattening it. Punch C pushes the shell into the die. Then a step in ring E applies end pressure to form the bead. Finally the bead is flattened between rings A and E. A wide rim must be bulged with rubber first

Most bulging dies are relatively simple. We give you designs for three kinds in this installment and the fourth will be described later. In addition, rules for calculating the shell are provided

The theoretical length of the straight portion of a shell before bulging (section 1, Fig. 4) can be found by subtracting the sum of the areas of sections 2 and 3 from the total area of the finished shell, and dividing the remainder by the mean circumference of the shell. The area of the finished (bulged) shell (Fig. 5) can be found by dividing the shell into sections and computing the area of each section from the formulas given in an earlier installment. For a 30% bulge, the actual difference between the length of the shell before and after bulging will be approximately two-thirds of the theoretical difference (h_1). This is because of the natural tendency of the metal to thin out during a bulging operation. Consequently, one-third of the distance h_1 (theoretical difference between the two shells) must be subtracted from section 1 to find the actual length of the straight portion of the shell before bulging.

When this correction has been made, the area of the cylindrical portion of the shell (section 1) is computed. The areas of sections 1, 2 and 3 are then added together to find the total area of the shell shown in Fig. 4. The square root of the total area is then extracted and multiplied by 1.128 to find the approximate diameter of the blank.

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TRIMMING OF BULGED SHELLS

Shells may be trimmed either before or after bulging, depending upon the shape and the size of the bulge and the accuracy to which the height of the shell must be held. If the height of the shell is given in fractions (fractional dimensions may vary 0.020 in.), and the shell is reduced in length only a comparatively small amount during the bulging operation, the shell should be trimmed before bulging (Fig. 6).

A plain cylindrical shell can be trimmed by any of the conventional methods, while bulged shells ordinarily must be trimmed in a lathe. A further advantage of trimming a shell before bulging is to provide a smooth, flat edge at the open end of the shell so the shell will sit squarely in the die and will not have a tendency to tilt sidewise during the bulging operation. Flanged shells should be trimmed before bulging.

DESIGN OF DIES

Four different methods are employed to expand or bulge drawn shells. These are:

1. Direct action
2. Expanding segments (mechanical)
3. Rubber punch
4. Fluid (oil or water)

Choice of method depends upon the size and

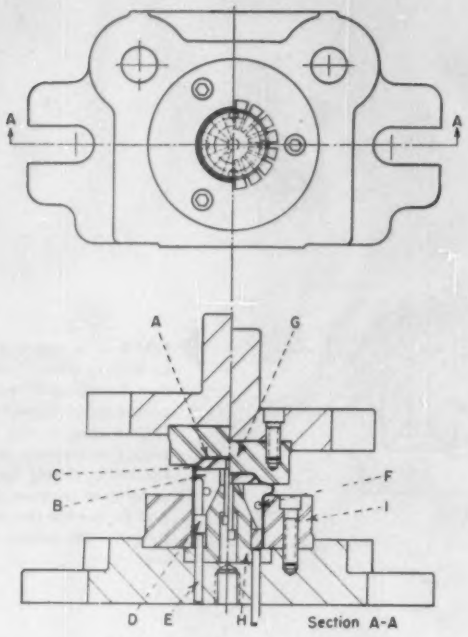


FIG. 9 . . . Segmental bulging dies are low in cost and upkeep, but the segments create small flats on the shell surface

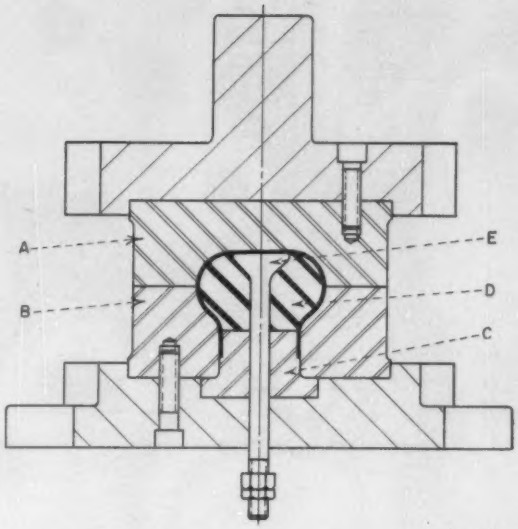


FIG. 10 . . . Small, flangeless shells are bulged by a rubber block retained by a stem

the shape of the shell, the thickness of stock, the number of pieces to be made, and the type of press available.

DIRECT-ACTION DIES

If the metal is relatively thick, compared to the diameter, small beads may be formed by placing the tube, or shell, in a die similar to that shown in Fig. 7, and applying pressure at the end of the tube. The bead should not be higher than one thickness of metal, and it should not extend over an arc for more than 90°. Otherwise the tube may collapse before it fills out.

In operation, tube *A* is placed in die *B* and rests on top of ejector ring *C*. Ejector ring *C* is actuated by a pull-up attachment which permits it to drop down out of the way when the slide of the press descends. When the press is tripped, ring *D*, which is suspended on springs *E* and stripper bolts *F*, slides down over the tube and contacts die *B* to form a mold for the bead. At the same time this action occurs, plug *G* slides inside the tube to protect the metal from bulging inward when pressure is applied at the top.

Continued descent of the slide causes springs *E* to compress. The tube is squeezed endwise between collars *C* and *H* to form the bead. Two beads can be formed in one operation with the same mold by using a split die. Such a die is hinged to permit removal of the work.

Another type of direct-action die which operates on a slightly different principle is shown in Fig. 8. This type of die is used to form small beads when the metal is bulged outward and then flattened upon itself to form a rim. The shell is placed in die *A* and rests on knockout plate *B*. Knockout plate *B* is normally held in a raised position ⅜-in. below the top of the die by a pull-up attachment. When the slide of the press descends, plate *B* drops out of the way and punch *C*, which is backed by spring *D*, enters the shell and pushes it into the die. Continued descent of the slide causes ring *E* to slide down over the outside of the shell. When the stepped portion of the ring contacts the end of the shell, it forces the metal to bulge outward into the form of a bead. This bead is then flattened between rings *A* and *E*.

When the rim is comparatively wide the metal must be bulged with rubber—as shown in the view at the right of Fig. 8, then flattened in a special operation.

SEGMENTAL DIES

Segmental, or mechanical expanding, dies consist of a number of segments held in a cluster by springs. The segments are made to expand (move outward) to bulge the work by being forced downward over a tapered punch. This action causes slight flats in the surface of the shell. These flats are negligible in many cases, but may be noticeable on large work or on polished surfaces. The width of these flats depends upon the size of the shell and the number of segments used. If only a few segments are used the space between them will naturally be greater than where a larger number are employed. The number of segments that can be used for a given operation is limited, however, by strength require-

ments. If too many segments are used to lessen the space between them when open, they will be weak and subject to frequent breakage.

The formation of flats, which may be noticeable and often objectionable, should always be carefully considered before a segmental die is selected. Except for this fault, segmental dies are considered superior to other types of bulging dies, because they are fast in operation and low in upkeep cost.

OPERATION OF SEGMENTAL DIE

A typical segmental die is shown in Fig. 9. Shell *A* is placed over segments *B* and rests on top of cap *C*, as shown in the open view of the die. The segments rest on pressure pad *D*, which is normally held in a raised position by pins *E*. The segments are held inward by spiral spring *F*. Spring F is made endless by screwing the ends together and then soldering them.

When the slide of the press descends, plate *G*, which conforms to the shape of the top of the shell, contacts the work and pushes the shell and the segments downward. During this travel, tapered plug *H* pushes the segments outward against ring *I* to expand the shell.

When the slide ascends, pad *D* ejects the work from ring *I*, and spring *F* pushes the segments inward back to their original positions. The completed shell is then lifted from the die.

RUBBER BULGING OF SHELLS

Three different types of dies which use rubber punches to bulge the work are shown in Figs. 10, 11 and 12. Each die is arranged to close around the work completely so that the metal is expanded to fit the inside shape of the die. This precaution is necessary in the design of rubber bulging dies to form a smooth, true outline.

The die shown in Fig. 10 is suitable for bulging comparatively small straight-walled flangeless shells. The die consists of pieces *A* and *B* which inclose the work, stool *C*, rubber cylinder *D*, and stem *E*. Stem *E* retains the rubber and aids in spreading it when pressure is applied to the top of the shell.

When a shell has a flange, the lower portion of the bulge must be confined by cams, as shown in Fig. 11, to permit placing the work in the die and removing it. The cams are normally held out in the position shown at the left of the centerline. When the shell is placed over the rubber punch and the press is tripped, cams *A* are pushed inward into position by cams *B* to form a solid mold similar to that shown at *B* in Fig. 10. Cams *B* then dwell while upper die *C* forces the rubber outward to form the bulge.

Large work should preferably be bulged in dies

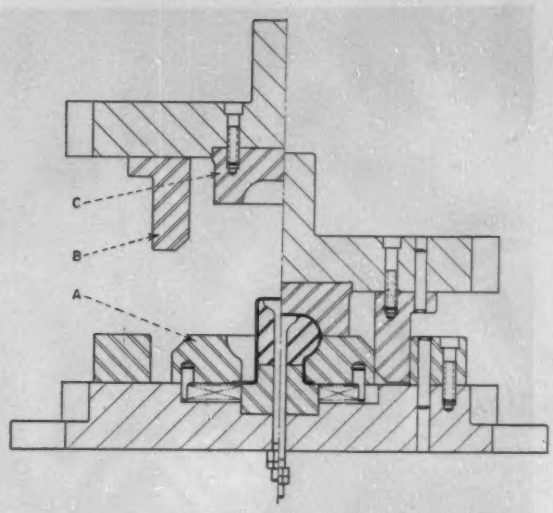


FIG. 11 ... Cams *A* restrain the flange and lower portion of the bulge, while the rubber forms the bulge into the "mold" created by the closed die

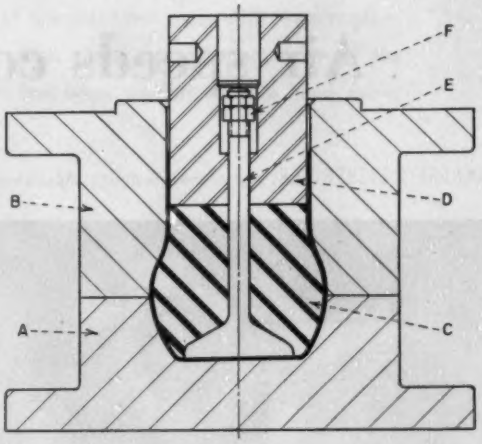
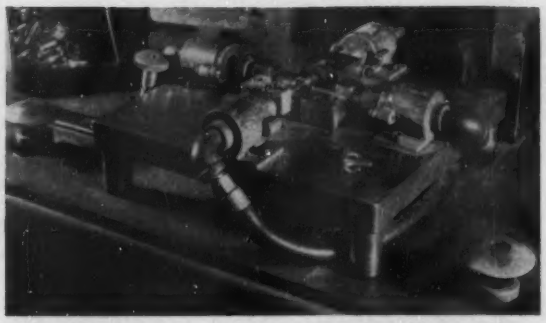


FIG 12 ... Large work should be bulged in a double-action die

similar to that shown in Fig. 12. With this die the mold is formed by pieces *A* and *B*, which are fastened to the bolster plate and the blankholder slide of a double-action press. The punch unit, which consists of rubber cylinder *C*, holder *D*, stem *E*, and nuts *F*, is attached to the punch slide of the press.

Rubber punches should be used only to form large, easy bulges, preferably of a spherical shape, which do not require that the rubber be expanded to assume intricate positions. Punches must be replaced after producing each group of piece-parts ranging from 3000 to 5000, with new, live rubber. Three different grades of cylinder rubber, having hardness numbers in the Shore Durometer scale of 30, 50 and 70, are used for this work.

Part XVIII of Mr Cope's series will appear in an early number.



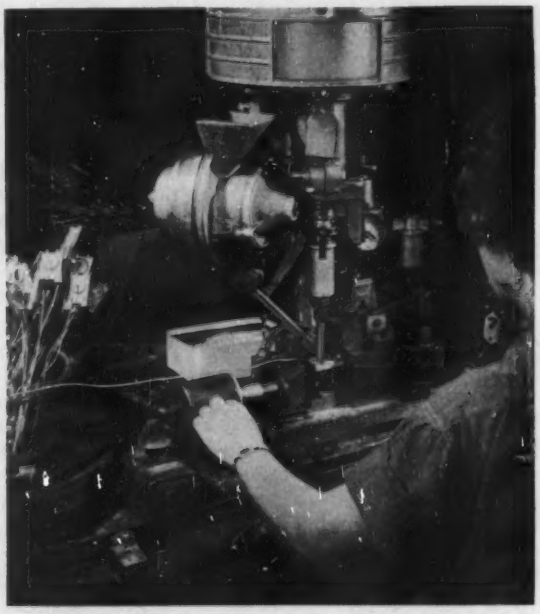
FIXTURE HOLDS BRASS SPRING with two side cylinders, uses rear cylinder to push plastic button over spring, and pushes key into assembly with front cylinder

FOUR SMALL AIR CYLINDERS in this fixture assemble pushbuttons for special-purpose control units. They are controlled by timers and solenoid valves for proper sequencing. Operator can easily exceed 250 assemblies per hr

Air speeds control-device assembly

DANIEL S LISBERGER, mgr of manufacturing, Appliance Control Dept, GENERAL ELECTRIC CO, MORRISON, ILL

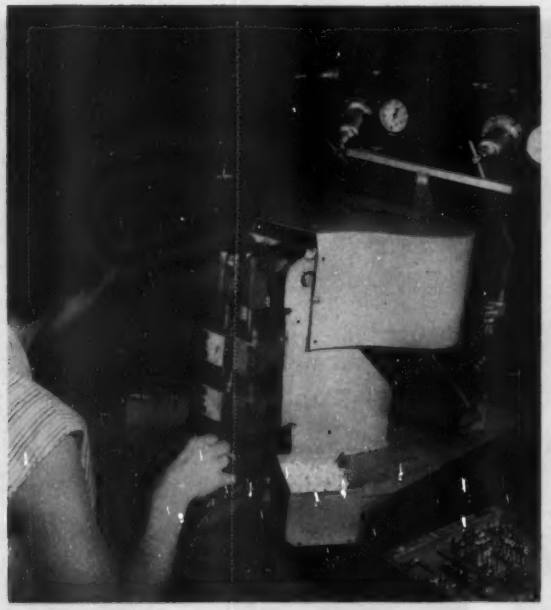
WEDGE-ADJUSTED CLAMPS actuated by air cylinder hold plastic part in fixture on Detroit power screwdriver while hopper-fed No 6-32 pivot screw is located and driven to depth. Guards cover clamps



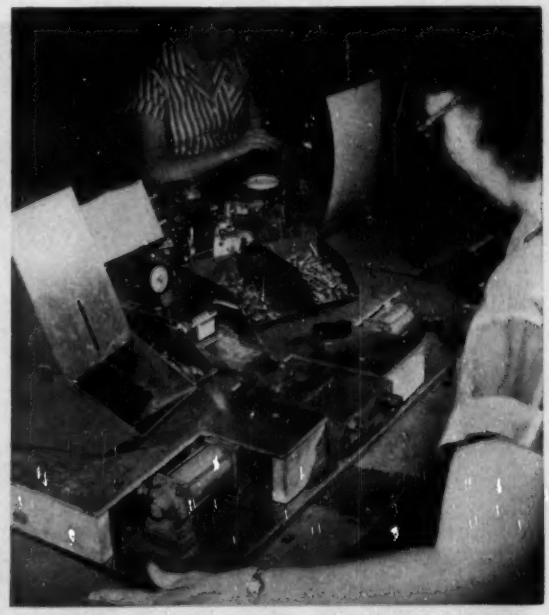
TWO SELF-TAPPING SCREWS are driven into a "cold-control" unit for domestic refrigerators, and two locking ears are closed with air-actuated fixture on this Shakeproof power screwdriver. With part locked in place by one cylinder, operator drives two screws, swinging fixture to locate part. When tool is moved to rear position, two limit switches are actuated in sequence to operate vertical air cylinder and move "wiping" slide, thus closing locking ears

ROTORS AND STATORS OF TELECHRON MOTORS for timer control on domestic electric range are assembled in this bench fixture. Assembly is located in tool, small limit switch actuates a solenoid valve that admits air at 80 psi to two air cylinders, squeezing stator laminations against rotor case

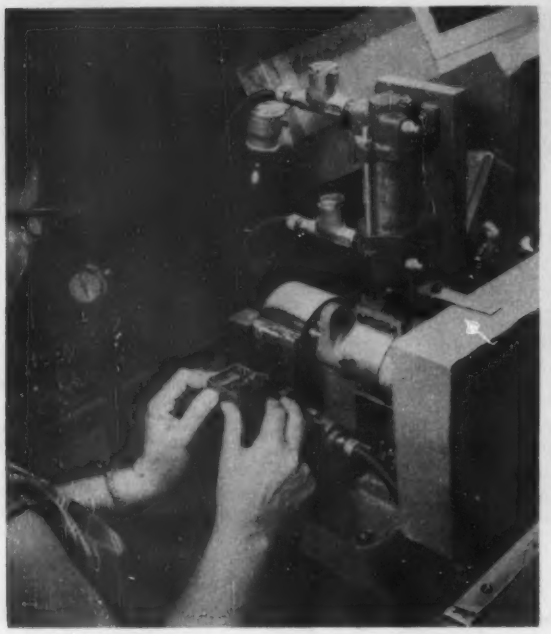
Tooling for high production of control devices must turn out best-quality work with combined operations that keep costs low. Air-cylinder tooling at this plant was made with these requirements in mind, and has the advantage of low construction costs, too. Here are some of the tools that work with pedals to keep operator's hands free when possible, or with hand valves when hands must be kept away from tool action.



CLEVIS-MOUNTED DOUBLE-ACTING AIR CYLINDERS operate two rams on this bench press to stack metal parts inside plastic case for control unit. Slide plate permits assembly of parts in front of press, so operator never need reach in under punches



THREE-CYLINDER FIXTURE assembles and locks three brass contact arms in plastic case of automatic defrosting-control unit made for domestic refrigerators. Two-hand control insures safety of operator

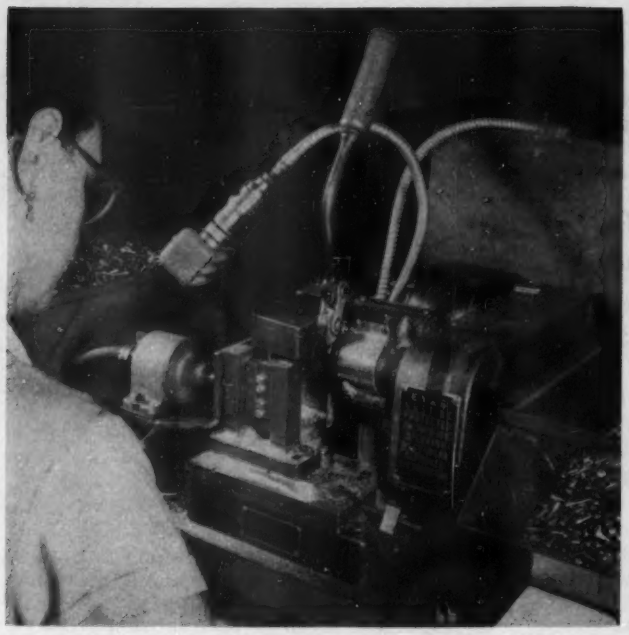


LENGTH OF GUIDE PIN in "cold-control" assembly must be held within 0.002 in. If too long, it is trimmed with form cutter in Rouse hand mill converted for power operation with double-acting cylinder. Small air cylinder in fixture clamps pin during milling operation

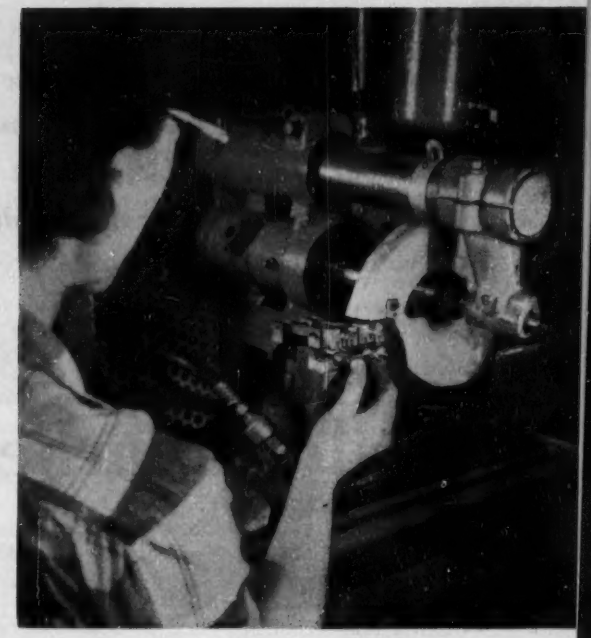
FOUR SPINDLES in this air-actuated bench fixture twist ends of contact arms in "cold-control" assembly for domestic refrigerator to lock them in plastic case. One cylinder raises assembly to insert arms in spindles, then horizontal cylinder moves rack to turn spindles 90°. Units are moved across bench in steel chutes

TWO 2½-IN.-BORE, 5-in.-stroke clevis-mounted double-acting air cylinders power this twin-ram bench press. Quick-disconnect couplings permit using either or both rams as tooling setups require

SMALL HAND ARBOR PRESS was converted for power operation of ram by connecting clevis-mounted single-acting air cylinder to hand lever, and by using a heavy spring to return ram at end of stroke



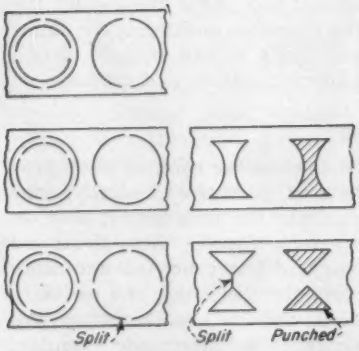
ENDS OF ALUMINUM SHAFTS for electric-range timers are slotted with 0.040-in. saw to depth of ⅜ in. four at a time in air-clamped fixture on Rouse hand mill. Clamp has self-compensating jaws. This fixture also is used for milling flats on side of same shafts



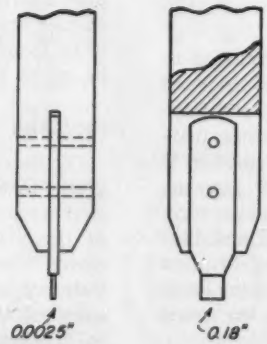
FOUR DIECAST RANGE-TIMER SHAFTS are clamped in air-actuated fixture having self-compensating jaws for milling trigger slots 0.040 in. wide, 0.060 in. deep, within 0.001 in. of position. Production averages 834 shafts per hour. Guard encloses 6-in.-OD saw blade. Table of U S miller is fed by hand

Diemaker's Kinks

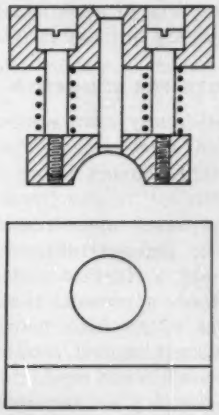
FEDERICO STRASSER



DRAWING of small shells in progressive dies is aided by carrying the part through the various stations by means of flexible attachments to the strip. Maintenance of exact centerdistances, or lead, is obtained by splitting the strip in one of the ways shown.



SLOTS in some work are best handled with punches of sectional construction. Often a piece of hacksaw blade, or small die-steel flats, can be ground on the end to the desired slot dimensions and secured in the slotted punch body with pins.



IN HORN DIES for punching round shells or tubing, shape the stripper to cover a large portion of the workpiece. This construction will prevent the work from turning on the horn.

- *Is yours a "slave" company?*
- *Will your product sell tomorrow?*
- *Can you compete in a tight economy?*
- *Are your plans flexible, to meet changing markets?*
- *Can you truly evaluate new-product potential?*
- *If your answers make you uneasy, here is how to plan . . .*

Product-market diversification

ARTHUR H JONES, vice president, FRANK C BROWN & COMPANY, NEW YORK CITY, Management Consultants

When a manufacturing plant or a laboratory has only one customer, it often is termed a "slave company," because its actions are controlled and limited to a considerable degree. A company with only one product or product line, similarly, is a slave to that product and its market. For some time there has been a movement toward freeing these slaves; especially those companies whose condition results from overdependence upon military contracts.

Within the last 10 to 15 years, many companies have acquired tremendous facilities, excellent manufacturing techniques, and outstanding reputations —all based entirely on military contracts. Even the government recognizes this as unhealthy. It would prefer that every company be in a position to maintain stability in a civilian economy and be capable of supplying military requirements.

STRENGTH FOR TOMORROW

While many companies are readily converted to this dual role, some companies should not be freed and others do not know how to achieve freedom. Nevertheless, in any freedom study, planning, usually, is based upon continuing, and increasing if possible, defense-contract products. The government has a right to expect continued cooperation from those companies that it has fostered and that it relies upon. Also, every manufacturing firm, in the national interest, should have some positive ideas about the kind of product it can supply in the event of greater defense requirements.

Our economy is based upon defense budgets to such a large extent that it would be unthinkable to drastically and suddenly curtail the research, development, and production of military inventiveness. Anything proposed in this article, therefore, assumes no relaxation in contribution to our national defense effort, except at the convenience of the government.

Those manufacturers who operate at the very heart of the electronics, aircraft, and nucleonics portions of the government's preparedness programs are in an expanding "industry within an industry," even if the total military budget should decline sharply in the years ahead. Perhaps these people should be less concerned with external diversification and should concentrate on internal product quality, non-military applications, lower costs, and broader markets. However, some prime contractors depend so heavily upon the military demand for their product that the health of the company, and the livelihood of thousands of employees, depends upon the budget-attitude of Congress.

In this category, management has a double responsibility. Both the national defense and the prosperity of large communities depend upon the productivity of the plant and, if the demand for the former decreases, the economic position of the latter is in jeopardy. Thus, much serious thought should be given to non-military products and markets.

PROBLEMS YOU FACE

On the fringes, or beyond the core, of these programs are thousands of companies, usually subcontractors, which supply the government directly or the prime contractors. Among these firms are many "slaves." They are less protected and more vulnerable to policy changes than the primary sources; they are less able to absorb fluctuations in demand. To this group we direct our attention.

Before starting the search for a commercial line of business, it is necessary to do a detailed analysis of the company. Lip service to diversification is frequent; a determined effort to achieve it is too often lacking. The first step is to know exactly where you are and where you have been. Competitive commercial operations bring many hard-to-swallow pills. For example, the personnel and accounting

procedures under which government contracts are performed may prove too heavy a burden for the commercial consumer. Usually they can be pared. Designers will be concerned with price and customer appeal as well as ideal operating characteristics. Production, and the "wanted date," will be determined by market studies and merchandising techniques. Sales people will have to *sell* instead of performing a liaison function.

Time and money must be spent in seeking, developing, promoting, marketing, and servicing products. The necessary amount of each varies with every case and is not readily foretold. It often is wise, when properly advised, to set a preliminary ceiling as a control point. If there is a top financial limit, time otherwise spent investigating ideas too costly can be saved. Discouragement comes easily, especially after months of "outgo" and little or no income. However, this can be expected and, if a competent study has shown a practical market for the product, patience is essential. Launching a new product is almost always speculation. *Don't invest more than you can afford to lose.*

Past experiences and the attitudes of key people in the company must be reviewed. Contacts and reputations can give a big boost to a new product. Many organizations, lacking experiences in consumer markets, find themselves in an unhappy situation when they take on consumer products and the accompanying problem of distribution. Other companies, with no more experience, have been most successful. Product, people, production, and promotion must be right.

ATTITUDE IS IMPORTANT

One important consideration, when a company's product has been entirely for military purposes, is the attitude toward design. Precision, nicety of technical design, and perfectionist attitudes are properly critical for military equipment upon which lives may depend and, for that matter, upon civilian equipment in the same category. However, temperature, altitude, humidity, fungus, maximum endurance, and other factors important to military devices require time, money, and expensive test equipment. If the commercial product involves all of these requirements, will it be marketable? Will any of these factors increase its saleability? What refinements can the product include and still be within the buying power of the greatest number of potential purchasers?

Then there is the problem of product obsolesence. While some of our military equipment may be obsolete before a design is finished, it may still have to go into production. In any case, the contractor has been paid for his development work. In commercial products, each manufacturer must pay for his own research, development, styling, and tooling. Meanwhile a potential competitor may be about to introduce a device which will obsolete all of this work. These factors cannot be weighed in advance, but they must be considered.

Before any search for products can begin, all of these points should be understood by those concerned. "Products" cannot be guaranteed successful. Those people making the study must have understanding, support, and cooperation, or their task will be too difficult.

When attitudes and financial ceilings are understood, the next steps must be determined. In many cases it is expedient to investigate "on the shelf" items for possible commercial potential. In the course of many contracts, devices have been developed as part of those contracts, *or as aids in performing the work required to produce the desired equipment*, which in themselves offer commercial possibilities.

WILL IT SELL?

However, it is both easy and dangerous to be swayed into seeing unrealistic markets for a product simply because most of the development and tooling are completed. Preliminary analysis must be based upon the optimum market requirements. The following questions are pertinent:

1. Does a market exist for this product?
2. If not, could a market be developed?
3. Should it be redesigned for technical improvement?
4. Should it be redesigned for styling? Consumer appeal?
5. What order of magnitude could be expected of the commercial market?
6. How would it be sold? Salesmen? Distributor? Dealer?
7. Can the sales force, as is, be effective?
8. Will field-service facilities be required? Where and what cost?
9. Will selling require demonstration?
10. Who else is in the field?
11. Who might be entering the field?
12. Is this device apt to become obsolete at an early date? When?
13. What will it replace, augment, or complement in use?
14. What will costs be before orders could be expected?
15. What is the top selling price tolerable for this unit?

For the same investment in developing, advertising, manufacturing, selling, and servicing, could a better return be expected from something else?

When all of the above are satisfactorily answered, it might be interesting to sense what would happen if the anticipated customers for this product were largely dependent upon military contracts which were later curtailed. A "commercial" product sold almost exclusively to military contractors does not satisfy the determination to free oneself from complete dependence on such contracts.

In the course of a defense development contract, a certain firm developed some very unique devices as parts of a very complex mechanism. While all the engineering and production were very well done, especially clever was a little black box which sup-

plied important data. Real inventive skill and unique packaging brought together in this black box a demonstration of basic scientific knowledge. The management was certain that this device would be an excellent commercial product. NOTE: The management had firmly decided that this would be a good product *before* investigating the points given above.

A thorough investigation of this "product" resulted in an unpopular report because decisions were made before, rather than after, the study was made. Investigators agreed that the device was beautifully designed. However, it was pointed out that a complete redesign would be necessary to permit its use independently of the system for which it had been developed. It was further uncovered that the device would only supplement, but not replace, other devices; that while the information from the device would be nice to have, it was not essential. Certain developments being carried on elsewhere indicated that the black box might be obsolete in a few years unless it was further redesigned. National field service would have to be established. Initial sales and promotional costs would be high. The market for these units per the years over which it would be necessary to write off the costs of redesign, sales, and service of the black box was too small to permit this write-off and still keep the price within an acceptable range. This, of course, is a digest of a complete study. One conclusion was that for the amount of time, effort, and money necessary to put this device on the market, some other product would give a much better return over a longer period of time.

DEVELOP OR BUY?

Not always are the results of these studies negative: It is of course, much pleasanter for all when they are positive. An employee group could be most reluctant to submit a report contrary to the President's dreams. A recent study, performed for another government contractor, indicated that several devices would have high scores as potential products with some redesign for styling, and a lower price. A lower price does not necessarily require a cheapening of the product because a relaxation of strict military specifications frequently is possible in a reliable commercial device. Also, higher production can lower manufacturing costs.

In this second case, it was determined that the company's own sales force should first make a survey of potential customers. From this survey, data were compiled on changes in markets, design, selling price, and service requirements. It was necessary to stimulate the sales force because, while they were high-caliber people, they had become accustomed to "take orders" rather than do "selling." *This complacent sales attitude must be watched throughout industry where a good reputation as a sub-contractor to the key defense industry has attracted business without the need for continuous hard-hitting selling.*

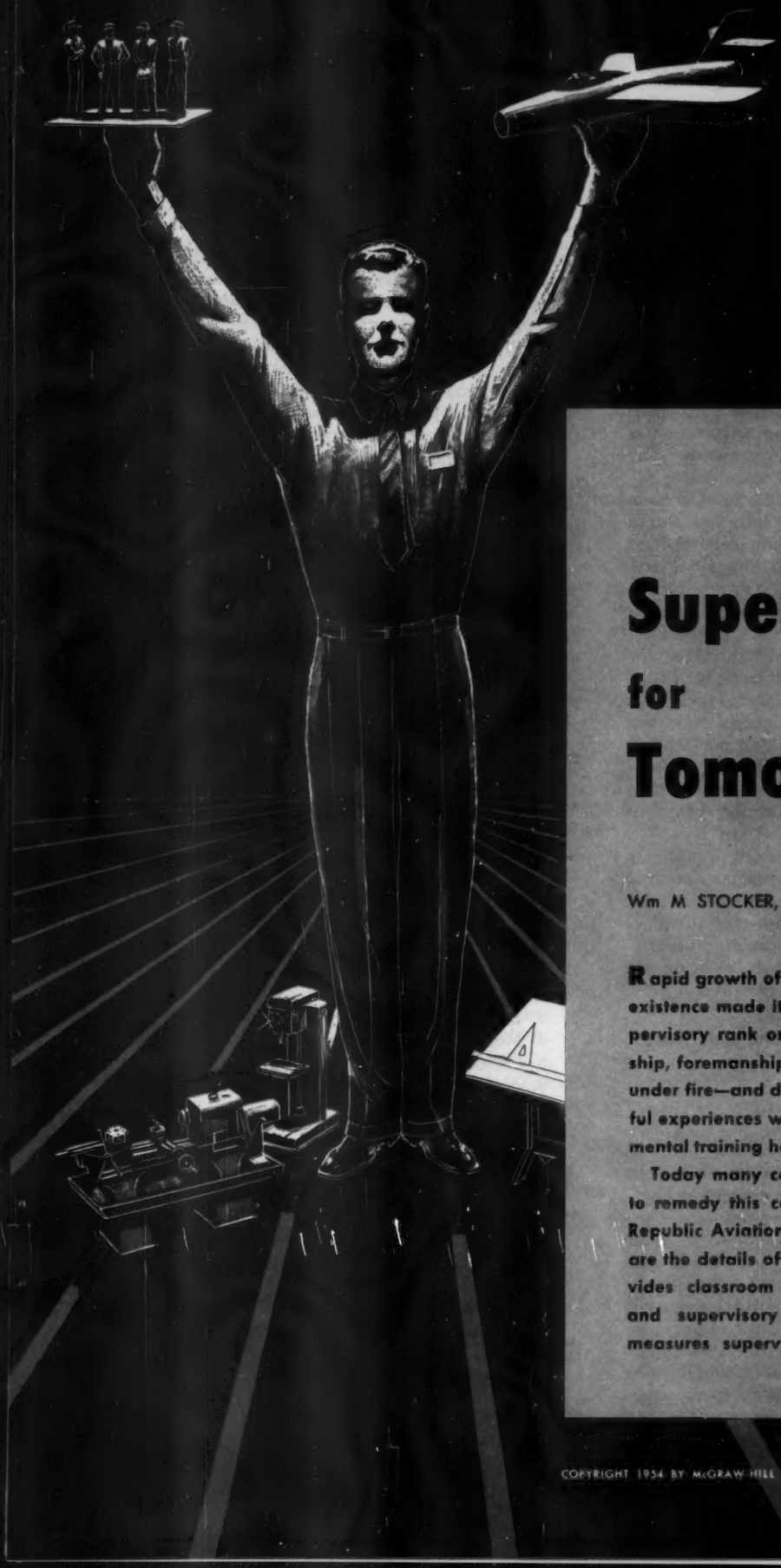
When products cannot be found within the organization, several steps can be taken. It may be desirable to explore the possibilities of acquiring a product and/or a business with a product. Great care should be used here for the obligations, reputation, markets, technical failures, and obsolescence of the product, or business, are not always readily uncovered. It has become a common practice today to diversify by purchases of companies, sometimes in an entirely different line of business. Some nationally known manufacturers are unhappily familiar with the grief of such purchases, while others are gratified with their acquisitions. It is not possible to have a canned set of rules to observe before acquisition. Tax attorneys, public accountants, and consultants must analyze all of the many facets.

Still another technique which may be more costly at first, but could reap a more attractive future, is to be original. A complete study of an industry will indicate many problems requiring a new or better solution. Most large companies, of course, have groups continuously searching for, and trying to solve, problems. Thus, their knowledge of industry eventually reduces the need for problem searches. They are aware of enough problems to keep busy for a long time. The smaller firms that find and solve problems may arrive at a unique patent position and be first with the best. Warning: pioneering can be expensive, with others taking advantage of it when the pioneer's funds are exhausted.

When the talents, specialized training, and time exist within an organization, much of this research work can be done by company employees. The dangers are that, in the midst of the program, those assigned to the studies are frequently diverted to the inevitable "crash programs." It is especially difficult for an employee to be objective in a study where he or his superiors may have or expect to have an interest. If his superiors appear to have a preconceived attitude, it is not easy for the analyst to maintain a truly open mind. Outside consultants, doing this work all of the time, have developed techniques, files, and contacts which expedite their work. Not being emotionally involved, their study can be factual without bias.

MAINTAIN BALANCE

New products are important for some companies and should be avoided by others. Defense contracts are responsible for much of our recent scientific advancement and often a moral obligation exists for continued cooperation with agencies of the Department of Defense. Therefore, the sense of balance must be individually determined. Many key employees may feel more permanent with their employer when there is less dependence upon one customer. Regardless of who is assigned to study diversification, it must be realized that there is no magic wand that will bring the solution. The work must be thorough and a definite answer cannot be guaranteed. Have confidence in those making the study but select them carefully. Results may seem intangible. In the final analysis, remember that any answer based on research is safer than a guess—and a negative answer may save a large sum of money; more painful disappointment.



American Machinist
SPECIAL REPORT
NUMBER 371

Supervisors for Tomorrow

Wm M STOCKER, JR, associate editor

Rapid growth of the aircraft industry in its 50-year existence made it necessary to promote men to supervisory rank on the strength of good workmanship, foremanship, and seniority. They had to learn under fire—and did. But it wasn't easy; many painful experiences would have been avoided if fundamental training had been possible.

Today many companies have training programs to remedy this condition. One notable plan is at Republic Aviation Corp, Farmingdale, LI, NY. Here are the details of their one-year program that provides classroom instruction, on-the-job training, and supervisory experience; that teaches and measures supervisors for tomorrow's production.

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What should

Aircraft production, tomorrow, can be expected to far surpass the mechanical and electronic complications that we now know. Thus, highly technical jobs will develop in production requirements; jobs requiring extensive shop experience plus engineering skill. Even now, the once "theoretical" sciences are knocking on the shop door. Tomorrow's foreman will not only have to know how each operation is performed, but why it is necessary, how the material reacts to the operation, and the critical requirements of each part. Also, he will have to have a good grounding in industrial organization plus a knowledge of human relations. He must be trained to readily absorb new methods and to adapt existing techniques to new problems.

At RAC, these requirements are being fulfilled in two directions. Working supervisors attend regular conferences which provide education in new management techniques and in new technical skills. These are mandatory conferences and supervisors are excused only in extreme emergencies. Also, the company shares in the tuition cost of formal schooling, in subjects related to the students job, for certain employees. Thus, newly-appointed supervisors, as well as old-timers, are kept informed; can earn advancement.

However, the program just outlined is entirely separate from the subject of this report. Knowing that it will require an even larger supervisory staff in the years ahead, RAC organized a special supervisory trainee program aimed at providing production-trained leaders. This program consists of one year of on-the-job and classroom instruction.

To know their job, supervisors must understand:

1. **The Product**
2. **The Job**
3. **The Company**

On this basis, the entire program was planned. One of its major assets is that it provides the trainee with a broad knowledge of the entire company operation. Regardless of his assigned position upon completing the course, each man is familiar with the operations both preceding and following his specific responsibility.

One top-management member of RAC remarked upon concluding an interview with a training-program graduate, "This is amazing. He knows more about the inter-relationship of our manufacturing operations than anyone I've talked to in the company."

While this statement may be a slight exaggeration, it does have a basis in fact. Each trainee will, upon completion of the program, know the functions of each department in relation to the product and to the company scheme of operation. He will know, and will have performed, the functions of a production supervisor, and he will have studied in detail the departmental organization developed to fulfill these functions. At the same time he will have taken an active part in every step of aircraft manufacture; will have seen the product of 30,000 employees grow from individual details to acceptance by the customer in final form. And, each trainee's practical experience will have been supplemented by classroom lectures plus question-and-answer sessions to provide associated details and general company information. *This* is training as it should be. Little imagination is necessary to see how valuable a man with this background could be in freeing a department head of many operational details so that the senior man can devote more time to the problems that only his years of experience can solve.

ELEMENTS OF MANUFACTURING

"The Product" is the most important factor in any manufacturing organization. The success, or failure, of the entire enterprise, the jobs of its employees, and the future of the company are dependent upon product acceptance, quality, and delivery on schedule. In addition to the production operations, here is a partial resume of related subject data important to the supervisor:

1. Project identification
2. Assemblies, sub-assemblies and details
3. Blueprints
4. Methods breakdown
5. Operation sheets
6. Sequence of operations
7. Loading
8. Scheduling
9. Production planning breakdown
10. Part and tool order procedures
11. Estimating
12. Material planning and Material
13. Material handling — requisitions
14. Tool liaison details
15. Prior and subsequent operations tie-in
16. Multiple use — left and right hand call-outs
17. Equipment limitations
18. Material and tool rework
19. Inspection stations and procedures
20. Stores procedures — raw and finished
21. AN manuals
22. Engineering manuals

supervisors know?

23. Standards Manual
24. Alcoa extruded die manual
25. Incorporation of ENs and ERAs (EAIs and revisions)
26. Prototype tooling vs production tooling
27. Hardware
28. Lofting and mock-up
29. Tolerances
30. Bend allowances
31. Safety aspect of manufacturing methods
32. Tools, jigs and fixtures — numbering codes
33. Current standard tool and die list (Tool Control)
34. Republic Specifications — finishes, bends, etc.
35. All shops — nature of operations
36. All hangars — nature of operations

"The Job" refers to the supervisor's responsibilities as a representative of Management. His tasks are manifold for, in addition to acquiring the technical knowledge necessary for the proper performance of his job, the potential supervisor must also prepare himself as a leader of people. And people are seldom as predictable as metals and machines. The engineer may not understand human relations; the supervisor must understand. Hence, at RAC, emphasis is placed on this training. Supervision can make or break a company by its attitude and answers to the countless problems and questions that arise.

To simplify the supervisor's job, as well as to maintain standards of operation, the company has established policies and procedures. It also provides many services, benefits, and employee facilities. These things must be thoroughly understood by the supervisor so that he can make sound decisions without hesitation. When *he* has a question or a problem beyond his level of responsibility, the supervisor should know whom to contact and where to find the answer.

During the program, each trainee discusses the details of his potential job with working supervisors and with the people responsible for each function. Here are some of the subjects:

A. Assistant Foreman's job classification. (Scope of duties and responsibilities.)
B. Familiarization with related superior supervisory classifications.
C. Familiarization with related subordinate classifications.
D. Company policies and procedures:
    1. Employment
    2. Indoctrination
    3. Job assignment and fellow employee introduction
    4. Disciplinary code
    5. Suspension before release
    6. Company — Union contract
    7. Transfers
    8. Resignations
    9. Passes
    10. NEMA job class system
    11. Employee benefits — (welfare, recreation, etc.)
    12. New employee follow-up
    13. Wage and salary payment policies
    14. Supervisory rating practice and report
    15. Shop staff meetings
    16. Organization charts
    17. Training facilities
    18. Emergency fire, medical, and security procedures
    19. Insurance policy
    20. Industrial relations organization
    21. Plant layout diagram
    22. Plant layout and equipment service
    23. Maintenance and facilities services
    24. Vacation policy
    25. Time study system
    26. Production control-system
    27. Traffic system (within grounds)
    28. Ride Bureau
    29. Housing Bureau
    30. Company publications
    31. PA system
    32. Payroll-savings plan
    33. Veteran's services
    34. Industrial relations counselling service
    35. Rest periods
    36. Lunch periods and facilities
    37. Rest room facilities
    38. Locker room areas
    39. Travel Bureau
    40. Expense account procedures
    41. Reclamation service
    42. Office service, print shop, and supplies
    43. Public relations organization
    44. Labor relations organization

The Supervisory Trainee Program at Republic Aviation Corp is conducted by the Training Division of the Industrial Relations Dept, Mr C D Ruyle, Director. The Training Division is supervised by Mr L P Wenk, Director of Training and Personnel, and Mr W C Harris, Training Supervisor. In successive years, actual direction of the program has been handled by Mr Donald Gottsch, Mr Harvey Wolfe, and Mr David McQueen.

How to organize..select..direct

Cooperation is the key to an effective training program. And cooperation is only achieved when it starts from the top. This fact is especially true of supervisory training. Top management should not expect maximum effort unless it is willing to actively and wholeheartedly support the development of its junior representatives.

Union cooperation, too, is extremely important to the success of the program. One of the first steps in preparing a supervisory training program should be to invite in the union representative to explain the details and aims of the program. With the industrial relations programs established in modern industry, it is to the union's advantage, too, to have well-trained supervisors dealing with their members. Properly interpreted procedures simplify the problems of labor and management. Also, as an investment in the future, supervisory training benefits every person in the company.

Cooperation, plus an appreciation of the importance of the program, is essential throughout the company. Every effort should be made to have the top men in each department explain their operations and functions to the trainees. Words that come "straight from the top" carry more weight.

Before any formal plan was made, questionnaires were sent to supervisors in every department of the company asking what topics should be included, which details should be stressed, and what problems were most prevalent. Then department heads were personally interviewed and finally, after a series of conferences, the program was set down on paper in detail. Again, it was reviewed and discussed. When all of the principals were in accord, the program got under way.

The purpose of the Supervisory Trainee Program is to train specially selected, qualified young men, who have secured related industrial knowledge and other managerial-background requisites in approved colleges, for potential supervisory positions. Training is primarily directed toward the orientation of the trainee within the supervisor's scope of the production departments and in grounding him in the product, manufacturing methods, equipment, procedures, and corporate policies.

Trainees are selected from two sources. Half of each class is comprised of men, educationally qualified and recommended by their supervisors, who have been selected from within the company. These men have proved worthy of management training in the performance of their assigned duties. The other half of the class is recruited by scouting engineering college seniors. Upon graduation, the men selected report for training. Selection, in the latter case, is not based wholly on top grades. While the men must have good class standings, they also must have enthusiasm, cheerfulness, good appearance, community spirit, common sense, and broad general interests. Production supervision seldom is a job for introverts. A basic prerequisite is a genuine desire to take part in the program. The starting salary is slightly above average for newly graduated engineers and the benefits accrue rapidly. As originally planned, each class consisted of twelve trainees. The current class numbers 23 trainees.

Program presentation consists of departmental assignments covering all production and allied areas throughout the plant; is designed to expose the trainee to actual "on-the-job" situations. Daily classroom instruction incorporates the supervisor's approach to company policies, procedures, and personnel management, with emphasis on actual case studies. The trainee also attends a series of the scheduled supervisory conferences which are conducted weekly for the managerial development of *all* production supervision. During these conferences, the trainee is encouraged to present his inquiries and to participate in active discussions on the subject matter, meanwhile contributing constructive suggestions. The Training Division Film Library also is available for periodic viewing during the program.

The ultimate aim of the allied conference time is to more efficiently assist the trainee in a thorough indoctrination of the principles, as well as to further develop the qualifications necessary in a production supervisor. One other advantage in having the trainee attend these sessions is that he becomes accustomed to conference procedure; he learns to "speak up" in a group and he will more readily overcome any tendencies to be shy or "stage frightened." Oral communication must be emphasized as a management requirement. Encompassing a full, one-year period, the training program puts the trainee to work in virtually every line and staff section of the company. For those departments in which it is not practical for the trainee to receive actual experience, the department heads lecture in scheduled classes. In addition, a 25-hr course in blue-print reading is given to each trainee.

He is to become thoroughly familiar with the operations of the section to which assigned, work under the direction of the General Foreman of each section, perform auxilliary supervisory functions such as instruction of new employees in the use of measuring instruments, interpretation of complex blueprints, advising as to the proper method of making layouts for new or unusual work. The trainee may assist supervision by observing conditions in

the section and making recommendations and suggestions in matters such as assignment of work stations and maintenance of production cycles. To put it succinctly, the trainee is expected to do constructive work and working supervision is charged with the responsibility of keeping him occupied and informed as long as he is assigned to sections under their jurisdiction.

The course consists of three phases:

First phase — 6 months — Non-production departments and staff services
Second phase — 4 months — Manufacturing shops
Third phase — 9 weeks — Special assignment

Nothing is left to chance. Trainee classes are divided into groups of two or three men each. Then a master schedule is prepared to coordinate each group in the best interests of the production departments and the program. Considerable dovetailing and planning is necessary to keep things moving smoothly. Trainee groups are designated A, B, C, etc. From the master schedule, each trainee is given a calendar-extract which shows where he is assigned during every day of the program. In addition to this, each General Foreman and each department head is sent a memo which refamiliarizes him with the program and provides a list of the names of the men scheduled for training plus the dates upon which they will appear in the specific supervisor's department for training.

Thus, at the beginning of the program, steps are taken to assure that all of the people involved with the program are informed about the schedule and acquainted with the procedures. The responsibility for keeping the program alive, moving, valuable, and acceptable to the supervisors in whose departments the trainee spend their time, rests squarely on the Program Director. Of course, he must have the full support of his superiors. In addition to planning and scheduling the program, the director also scouts the colleges for potential trainees, explains

SCHEDULE OF ASSIGNMENTS

1 . . 1 Week	Indoctrination & Plant Observation	22 . . 4 Days	Experimental & Reproduction
2 . . 8 Weeks	Methods Analyst Training (Integrated with Methods Training Group)	23 . . 1 Day	Accounting
		24 . . 1 Day	Payroll
		25 . . 1 Day	Timekeeping
3 . . 1 Week	Methods "on-the-job" Association	26 . . 2 Days	Suggestions
4 . . 1 Week	Production Planning	27 . . 1 Day	Field Service
5 . . 2 Weeks	Time Study	28 . . 1 Day	Reproductions
6 . . 2 Days	Job Classification	29 . . 2 Weeks	Tool Design & Tool Control
7 . . 2 Days	Industrial Relations Counselling	30 . . 5 Days	Tool Shop
8 . . 2 Days	Training	31 . . 5 Days	Material Preparation
9 . . 2 Days	Plant Layout & Equipment	32 . . 5 Days	Wing Sub-Assembly
10 . . 5 Days	Labor Relations & Public Relations	33 . . 5 Days	Steel Detail
11 . . 1 Day	Reclamation	34 . . 5 Days	Primary Assembly
12 . . 2 Days	Maintenance & Facilities	35 . . 5 Days	General Utility
13 . . 2 Days	Safety	36 . . 5 Days	Modification
14 . . 2 Weeks	Production Control	37 . . 5 Days	Fuselage Assembly
15 . . 5 Days	Inspection (Quality Control)	38 . . 5 Days	Wing Assembly
16 . . 4 Days	Material Control & Estimating	39 . . 5 Days	Machine Shop
17 . . 3 Days	Estimating	40 . . 5 Days	Fuselage Sub-Assembly
18 . . 1 Week	Engineering	41 . . 5 Days	Finishing
19 . . 1 Day	Receiving	42 . . 5 Days	Final Assembly
20 . . 1 Day	Shipping	43 . . 5 Days	Hangars
21 . . 1 Day	Purchasing	44 . . 49 Days	Final Assignment (to be determined)

Cycle # 1..SUPERVISORY TRAINING SCHEDULE

DATES:

	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP GROUP GROUP
ANGLE SHOP	A	E	D	C	B	OPERATION
TUBE SHOP	B	A	E	D	C	SHEET
STRETCH PRESS	C	B	A	E	D	FOLLOW UP
DRILLING & ROUTING	D	C	B	A	E	&
BRAKE DEPT.	E	D	C	B	A	SUMMARY

PERSONNEL TRAINING DEPT

Review:
Area Choice by:
Groups:

the program plans and aims to plant management, and expedites the program after it is underway.

KEEP TRAINEES USEFUL

No working supervisor will object to having another intelligent, useful man in his department. He will object to having a man just dropped into his department with no instructions except to "stand around and watch." The latter attitude has been the downfall of many training programs and the source of criticism and irritation from many managers. Also, it isn't very effective training.

Republic Aviation Corp, to prevent this condition, uses a number of devices. At the beginning of the program each department head is queried as to:

1. What useful and instructive task each trainee can perform while he is assigned to each department?

Keep Participating Supervisors Informed

July 2, 1953

Inter-Office Memo

To: Mr. A J Kelly, Dept Head

From: L P Wenk

Subject: Supervisory Training Program

This memo is for the purpose of setting forth the following schedule for the twelve Supervisory Trainees, who will report to you in groups of three each, for study and observation within your department.

Group "B"	Andrew Adlehardt John Maher Joseph Urban	July 16, 17, 20
Group "D"	Robert Gieser William Jones Arnold Neil	November 20, 23, 24
Group "A"	Alexander Gniasdowski John MacNab Arthur Wiggins	December 7, 8, 9
Group "C"	William Huston Donald Martin Benjamin Shepardson	December 14, 15, 16

For your assistance, there is attached a copy of the original curriculum outline, the extent of which was determined, by recommendations from your department, at an earlier date. The intent of the program is to expose the above Trainees to these related subjects with the purpose of developing well-informed future Supervisors.

The Trainees will report to your department at 8:15 AM because of conferences in the Training Department from 7:00 to 8:00 AM. It would be greatly appreciated if these employees could be released from your department at 2:30 PM in order to catch the 2:40 PM bus back to Broadhollow for additional conference work.

L P Wenk
Director of Training

2. Which points should be stressed?
3. How the supervisor intends to stress these points?

During this interview, the Program Director helps the supervisor to establish his relationship with the program and with the individual trainees. The director also explains the reporting system and guides the supervisor in planning his approach to training. Then, about one week prior to the arrival of each group of trainees in each department, the department head is advised by memorandum that certain men will be present in his department on a given date. Following the memo by a few days, the Program Director personally visits each working supervisor to provide a last-minute refresher and fill-in on any questions or details. While the trainee is in each department, the director visits him to check on progress, understanding, and unforeseen problems. RAC supervisors are enthusiastic about this system.

SPECIAL OPERATIONS TRAINING

Another very useful device for increasing the trainee's value to the supervisors in the production shops is to send each trainee through a concentrated two-week mechanics course at a local school. RAC maintains a special branch of the Casey Jones School of Aeronautics, adjacent to the Farmingdale plant, where new production workers are trained in specific operations such as riveting, welding, sheet-metal mechanics, inspection, and aircraft painting. All of the pertinent subjects are concentrated into a two-week course for the supervisory trainees, many of whom, despite their engineering training, have had little real shop experience. Thus, they do not enter the production shops cold.

Checks and balances

For supervisory training, the period of the program also provides time for an analysis of the management caliber of the trainee.

In addition, no Program Director is willing to take on faith that the presence of a trainee in a department is a guarantee that he has acquired the fundamental knowledge. Thus a report system is used to follow the progress of each trainee.

As a proportional requisite toward satisfactory completion of the course, the trainee submits a written report pertaining to each department in the curriculum. Each report follows a standard pattern (also training for future supervisory reports) with:

1. Title page
2. Table of Content
3. Abstract
4. Body of report
5. Conclusions and Recommendations

While on departmental assignments, each trainee is required to compile sufficient notes regarding operations and observations to provide a detailed reference notebook. The notebook must be available at all times for review. Reports are typed, with at least one carbon copy, and both copies are given to the Program Director. The carbon copy is placed on file for future reference and the original, after evaluation, is placed in the trainee's notebook. Upon completion of the course, the notebook should serve as a substantial handbook of company operations.

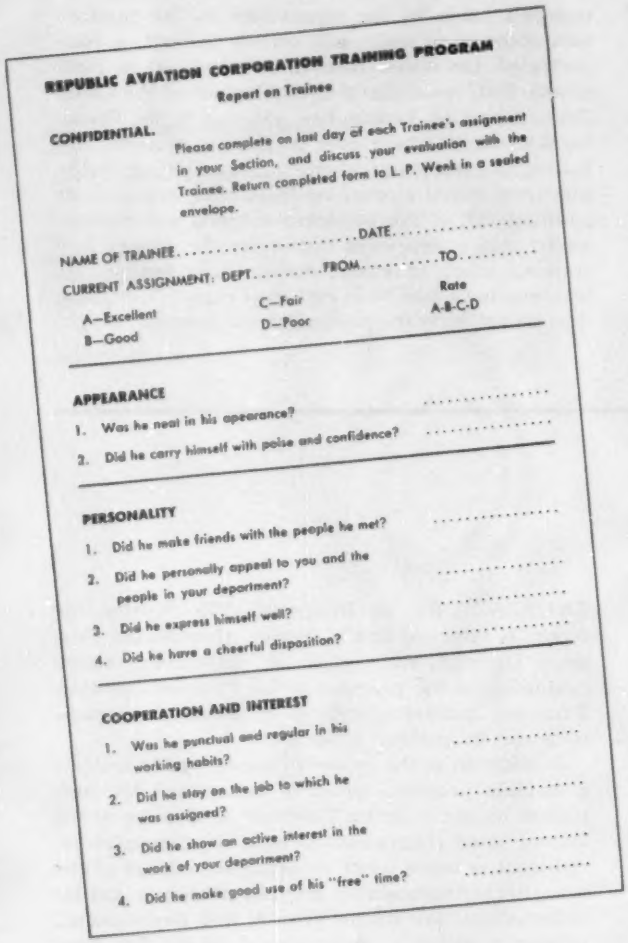
After reviewing each trainee's report, the Program Director forwards it to the department head of the section concerned. The latter, in turn, evaluates the trainee's ideas of how his department operates and grades the report either EXCELLENT, SATISFACTORY, or INADEQUATE. Finally, the report is returned to the trainee, through the Program Director, who reads the department head's evaluation in the presence of the Program Director. Thus any misunderstandings or incorrect assumptions can be clarified at once.

In addition to the report prepared by the trainee, a suitable progress report is maintained for each trainee by the Program Director. Evaluation of the trainee upon completion of each departmental assignment is based upon technical knowledge of the area, the trainee's ability to grasp situations, and his potentialities for future growth and development, primarily within a supervisional range. The head of each department completes a questionnaire regarding each trainee. He signs it; then the trainee reviews the questionnaire in the presence of the department head and, in turn, places his signature at the bottom. Every effort is made to keep criticism fair and constructive.

Special guidance is afforded each trainee on behalf of Management for the development of his capabilities in supervising people, working with people, and obtaining the best in return from people through practicing fairness in human relations.

FINAL PHASE

Upon completion of the first and second phases of the program, the trainee enters the special assignment phase. He is asked to list, in a letter to the Factory Manager, in order of preference, the three departments in which he would most like to work. Then, the Factory Manager assigns the trainee to the department in which he will be permanently



REPUBLIC AVIATION CORPORATION TRAINING PROGRAM

Report on Trainee

CONFIDENTIAL. Please complete on last day of each Trainee's assignment in your Section, and discuss your evaluation with the Trainee. Return completed form to L. P. Week in a sealed envelope.

NAME OF TRAINEE ..... DATE .....

CURRENT ASSIGNMENT: DEPT. ..... FROM ..... TO .....

A—Excellent B—Good C—Fair D—Poor Rate A-B-C-D

APPEARANCE

1. Was he neat in his appearance? .....
2. Did he carry himself with poise and confidence? .....

PERSONALITY

1. Did he make friends with the people he met? .....
2. Did he personally appeal to you and the people in your department? .....
3. Did he express himself well? .....
4. Did he have a cheerful disposition? .....

COOPERATION AND INTEREST

1. Was he punctual and regular in his working habits? .....
2. Did he stay on the job to which he was assigned? .....
3. Did he show an active interest in the work of your department? .....
4. Did he make good use of his "free" time? .....

INTELLIGENCE AND TRAINING

1. Did his answers to questions indicate an ability to think clearly? .....
2. Did he seem to be alert when you talked to him? .....
3. Did he ask intelligent questions? .....

RECOMMENDATIONS — (Check the one which most nearly applies)

1. Do you feel this man is a good risk as a supervisor for Republic?
   ( ) Definitely for long pull
   ( ) Will probably be satisfactory
   ( ) Only because of emergency
   ( ) Should terminate now
2. Does his PERSONALITY fit him for work in your department?
   ( ) Definitely yes ( ) Only moderately well ( ) Definitely no
3. Would you consider him for permanent assignment in your department?
   ( ) Definitely yes ( ) Only moderately well ( ) Definitely no
4. If unsuited for your activities, can you suggest other work for which he is better suited?
5. Indicate on the attached sheet anything not covered by the above which we may use in guiding this man.

SIGNED .....

DEPT. .....

TRAINEE'S SIGNATURE .....

Reports provide a constant check on trainee progress

located. Immediately, the head of the assigned department places the trainee into a program of intensive training, within the structure of the trainee course and worked out with the assistance of the training division. This final program is designed to prepare the trainee to take charge of a specific section as a first-line supervisor. During this phase, the trainee spends a period of time in the sections preceding and following that in which he will work.

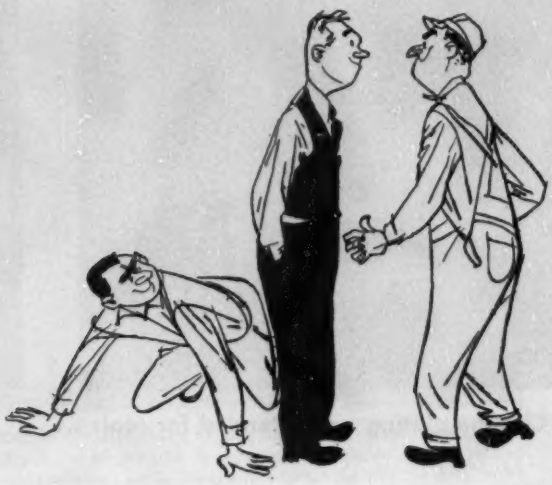
While the Factory Manager makes every effort to fulfill the trainee's request, each permanent assignment is at the discretion of, and for the best interests of, the company. If Management decides that the man's talents are more useful at some other point than he requests, that is where he is assigned.

Now in its third year, the program has proved most successful. Actually, this form of training has given the men such a broad knowledge of the company's operations that, while originally intended as a production trainee program, more than half of the men graduating from the class just completed were assigned to supervisory positions in non-production departments. Thus, the program is being expanded and the direction will be more general, rather than specifically for production supervision.

Trainees interviewed by the author at the completion of the last class were most pleased with the knowledge that they had acquired as well as with their permanent assignments. Here was an outstanding example of men prepared to move with confidence into the fast pace of tomorrow's manufacturing demands. *And tomorrow is here today!*

Round Table

Bums' Rush



"How are all the little old ladies in the machine shop, Al?"

"Oh, just great, Ed. I see you noticed how much like a European spy ring this place is getting to be. Everybody's buzzing with something."

"Yeah; but what's the secret—a party or a hanging?"

"A hanging, Ed. They're all worked up over the new engineer, and I guess they're plotting to do him in. Hilbert told me about it on the QT, and said he was disgusted with it."

"That shows Hilbert's good sense; but why are the rest of them all up in arms?"

"Well, the new engineer made a couple of bad errors last week, and they think he's a four-flusher and is going to louse up their bonuses. Actually, I don't think he did anything unusual for a new man, and he'll probably straighten out after a bit."

"But the boys aren't going to give him a chance, eh?"

"None at all. They're worked up to a fine pitch. I walk over to one group to break it up, and another one springs together across the floor. It's crazy!"

"I don't suppose you can blame them much, Al. If he pulled a few boners, you can't expect them to have full confidence in the guy that may determine how much they take home Fridays."

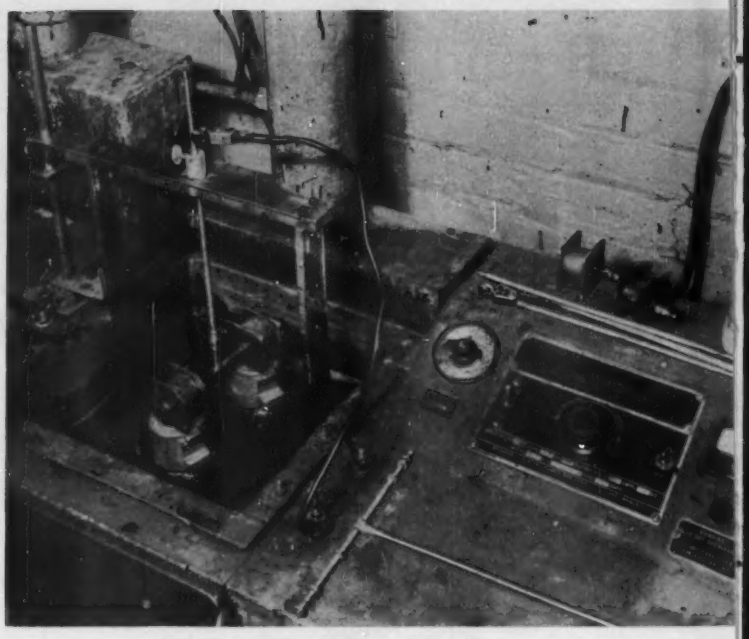
"Yes I can blame them, Ed. Those bums didn't give him a chance so far. It's even worse than breaking in a new machine man, although they hardly ever give any new man a decent chance. I never saw such a bunch for being unfriendly and distrustful."

"That's just the old shop spirit, Al. Watch out or someone will get your job, or make you work harder. It's common enough, and what can you do about it?"

"I can can a few of the troublemakers, Ed! That'll shut 'em up."

IS AL too critical, or are his workers? Is Ed right in expecting the worst from the crew, or should Al take firm action to protect the engineer? You may have useful ideas on the subject. Discussions of earlier topics appear on later pages.

Chrome-plating unit intended for tools . . .



has been usurped for salvage as . . .

Hard chrome plate pays unexpected

WALTER WHITE, MARTIN McKEAN, general foremen, TOWMOTOR CORP, CLEVELAND

To investigate more thoroughly the possibilities of hard-chrome plating on tools, Towmotor installed a Chromaster unit in the toolroom. Once we had learned how to use the unit we found it preferable to commercial hard chrome.

At first we had a tendency to plate too fast, which caused the plate to chip off in use. There were other difficulties because the procedure is not quite conventional. Work is cleaned with Enthone or carbon tetrachloride and, without any stripping operation on carbide or cast iron, plating is started immediately.

Two degrees of hardness are available. No. 1 is about 750 Brinell while No. 2 is about 1050 to 1100 Brinell. The softer plate appears preferable when lubricity is the major requirement.

One of the most satisfactory applications has been on taps and chasers. In threading SAE 4140 heat-treated steel, we had been getting 40 to 50 pieces per grind. With a chrome flash of about 0.0002 in. (requiring 3½ to 4 min) we have gone as high as 800 pieces per grind. For a uniform plate on chasers, without any buildup of chrome on the cutting edges, it is necessary to use a "thief." This is simply a piece of steel attached to a rod for connection to the same current tap as the chaser. Inserted in the plating solution, it steals much of the activity from the chaser and prevents uneven plating.

Carbide-tipped tools can be plated successfully, we found, only with a magnet to hold the steel shank. In fact, magnet clamps proved so convenient that they are now the standard holding practice for most small work. Areas immersed in the plating solution that are not to be plated are stopped off by coating with a pressure-sensitive tape.

RESULT OF AN EMERGENCY

Just as the plating unit was well-established for taps, chasers, and cutting tools in operations that were giving difficulty, without plating, and was being extended to other tools and to gages, we hit a snag.

Bearing holes in one lot of axle housings had been bored oversize. These were to be fitted with bearing liners. Housings are complex castings and extensive machining had already been performed, so they represented a substantial investment.

Chrome plating on tools had been limited to 0.0005

OVERSIZE HOLE IN AXLE HOUSING is salvaged by plating. Bottom of hole is plugged with rubber stopper and hole is filled with plating solution in which electrode is inserted

HOLE IN TRANSMISSION CASE is too shallow to hold enough plating solution so glass jar is clamped to underside of hole against rubber washer. Jar is filled with solution up into the hole to be plated

dividends

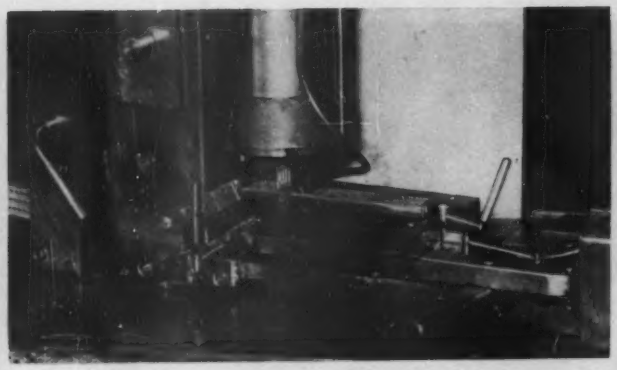
in., but tests indicated that we could go to 0.010 or 0.015 in., if necessary, for the purpose of building up the oversize holes and salvaging these parts. The axle housings would hardly fit our plating unit, so we set one up alongside the unit, plugged the bottom of the hole, filled it with plating solution, so the hole could serve as its own tank, inserted the electrode, and started plating.

With so little fluid, it was necessary to keep a close watch on temperature. (The character of the plate changes if the temperature goes above 90 F.) We found it necessary to change the solution about every 20 min.

In this way we salvaged the entire lot, ending with a product equal to the normal housing. Investment in the 32 axle housings was $5690; labor and other costs of salvage were $160. A succession of salvage operations have followed, saving many parts from scrap, but virtually removing the plating unit from its primary job.

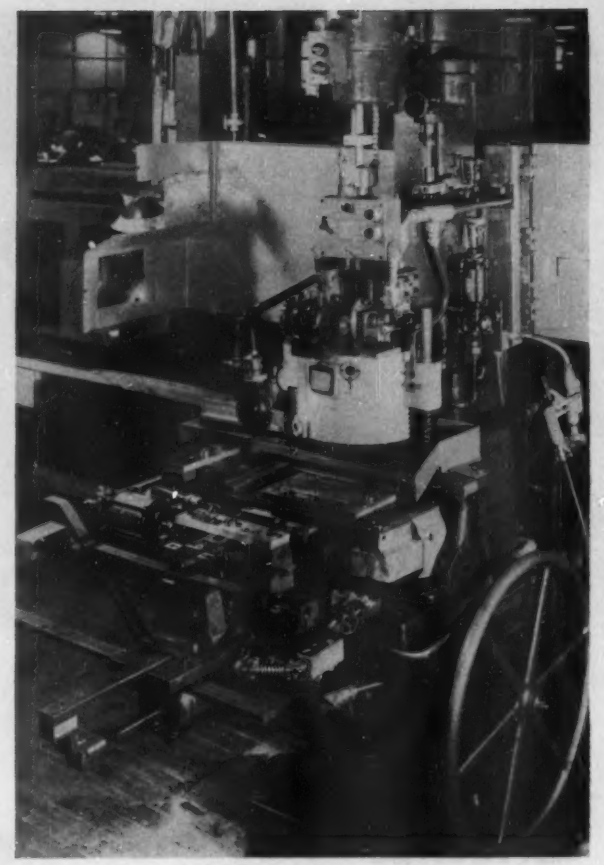
The obvious solution is another plating unit and we expect to have one (with tanks better equipped for salvage work) in the shop. Then the toolroom can again concentrate on plating tools and gages.

PORTABLE TANK has been rigged in shop (cables pass through wall from plating unit in toolroom) to handle surfaces on parts too large for plating-unit tank



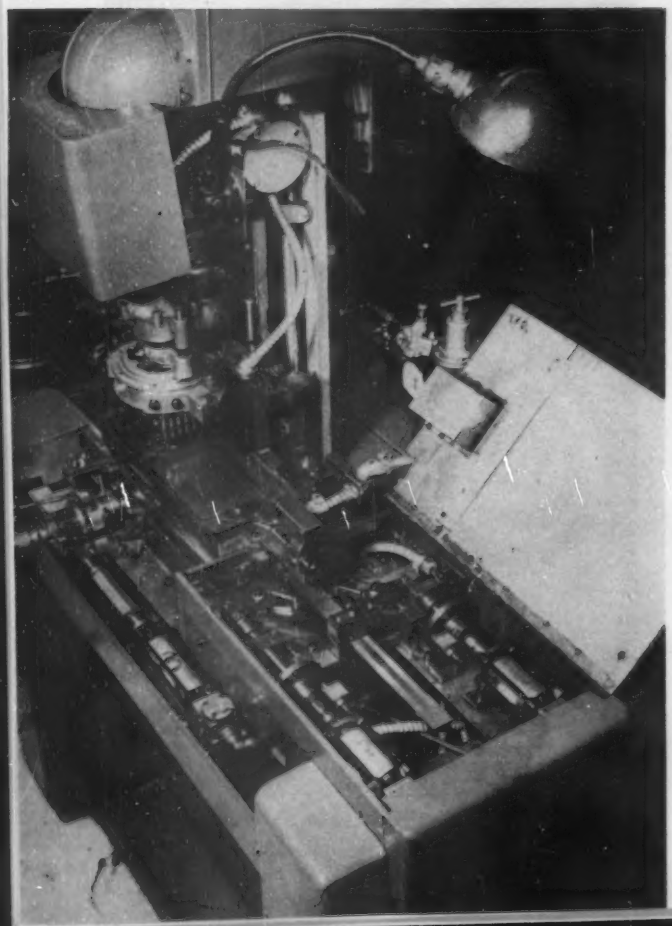
SPECIAL MACHINE taps 240 holes in rows of five. Center-to-center spacing is 0.156 in., row-to-row is 0.090 in. Thread is 0.072-in. dia, 48 tpi, of special rounded form to fit spiral-wound wire casing of machine-operating wires

BUILT AROUND a standard Allen drill, this air-operated, multiple drilling fixture drills up to 1080 holes in steel or brass pin-box plates in groups of 18. Indexing is automatic by means of air cylinders, and machine stops when last group is finished



Home-made machines make tabulator parts

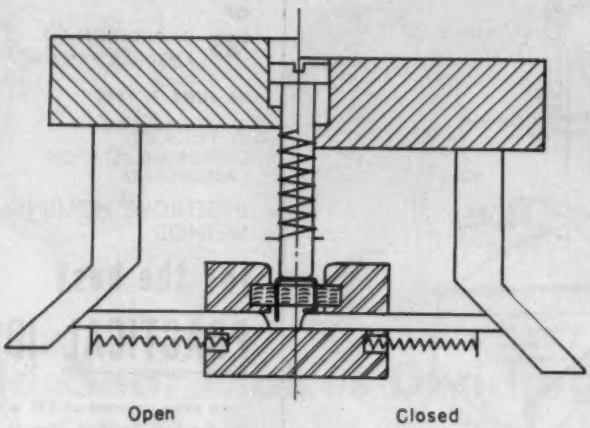
at Remington-Rand, Ilion, N Y



WIRING PINS are two-part assemblies originally put together by hand riveting. One part is now formed with two projections and parts are projection welded on a rotary table setup. Finished parts are ejected by air under shield at operator's right. Improved model of machine will incorporate magnetic ejection

AUTOMATIC TAPPING and countersinking machine handles pin plates with as many as 1080 holes. Tools are arranged in groups of six. Machine was built around standard drillpress and tapping head. Indexing of work is by air cylinders and ratchet mechanism

Practical Ideas . . .



Side Cams On Assembly Die Speed Switch Assembly

We had to produce some parts for electrical switches in which the required parts consisted of a fiber insulator surrounded by a thin brass contact. Because of the quantity required, we decided to make an assembly die which could be used to wrap the contact around the insulator.

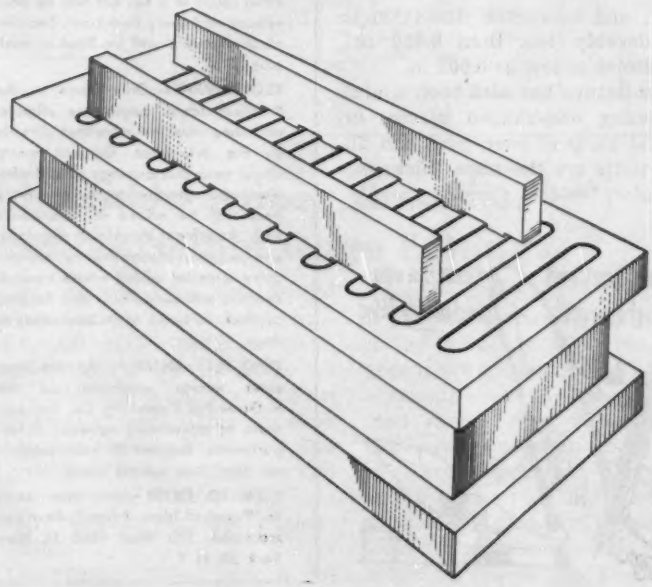
The die works like this. First, the fiber part is put in the die, and pushed against two stop pins. Then the pre-formed metal strip (U-shaped) is put in place on the fiber part. (That is, the two legs of the contact are put in two slots in the fiber stamping.)

Then the press is actuated, causing the hold-down pin to grip the parts in place. As the press descends, two side cams force two horizontal punches to fold the legs of the contact against the fiber stamping.

As the press ram rises, two compression springs force the side punches apart, and the plunger releases the part, which is then easily picked out of the die.

This die assembly method worked very well, enabling us to produce the high quantity of parts needed. *Federico Strasser, Santiago, Chile*

Notched Parallels For Magnetic Tables



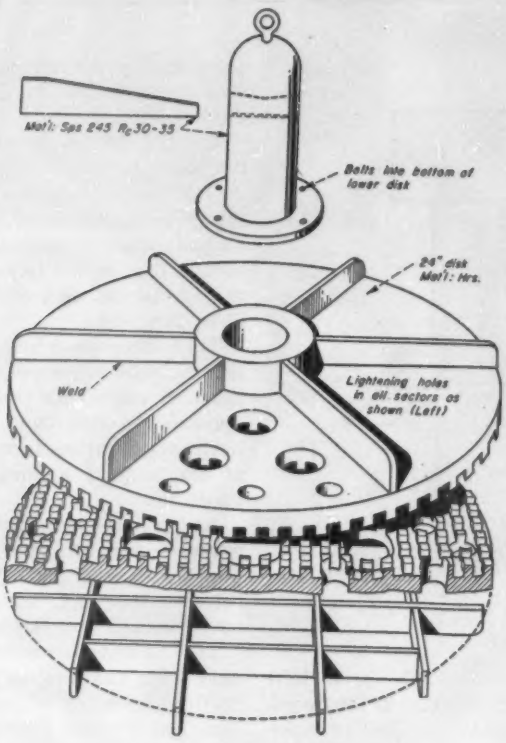
We have a few sets of the regular laminated commercial parallels made for use with magnetic parallels, but we needed some full-length parallels, so we made a set as shown.

Of course the regular solid steel parallels cannot be used on a magnetic table, because they "short" the lines of force, so the parallel is held, but the work is not.

To overcome this trouble, we notched the parallels, so one parallel touches only the magnetic poles, and the other clears the magnets and touches only the body of the chuck.

When notched in this way, the magnetic lines of force flow up through one parallel, across through the work, and down through the other parallel.

Such parallels can be made in a variety of sizes and shapes, to be used in pairs, and have proven very useful around the shop. *Robert Wiedenhoft, Brooklyn, NY*



Honeycomb Fixture Holds Rings Flat During Quenching

We had quite a bit of trouble with distortion when quenching large rings, so we decided to try to make a fixture to hold the parts flat, and still give the desired hardness. The fixture we made was found to be simple, practical, and effective. It combines lightness and rigidity, with maximum coolant flow, and has solved most of our problems of this nature since it was put into use a few months ago. Rings quenched in this fixture range from ¼ to 1 in. thick, with diameters to 24 in.

Speed is necessary when taking the ring from the furnace and getting it into the quench bath. A tank with an air or mechanically operated tray is desirable.

When using the fixture, we have had no loss of hardness, even where the work and fixture touch each other, and maximum distortion is considerably less than 0.010 in., sometimes as low as 0.002 in.

The fixture has also been useful hardening odd-shaped pieces, or several parts at once, provided all such parts are the same thickness. *E Taylor, Ontario, Canada*

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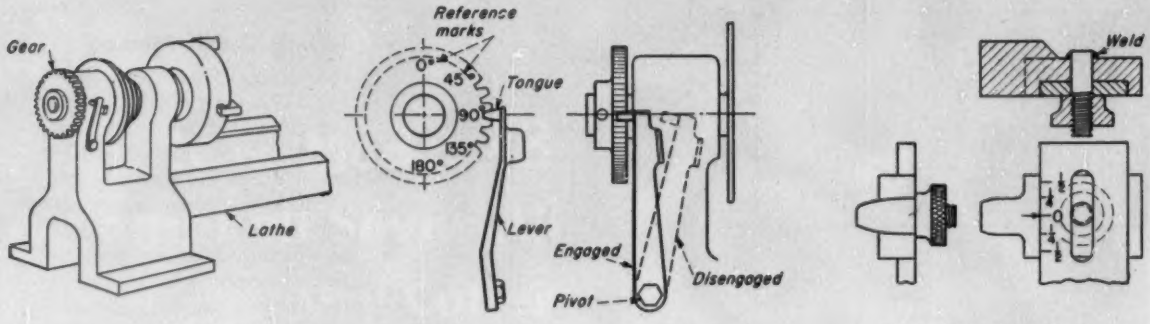


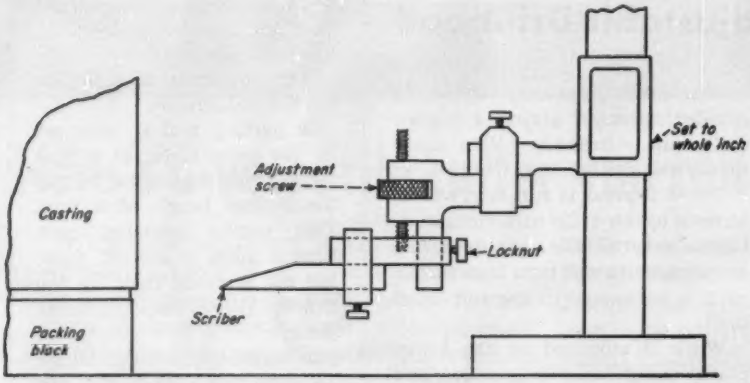
Installation

Subdividing head

Old Gear Makes Dividing-Head Lathe

Dividing-head utility can be built into a lathe around the shop by taking an old gear and mounting it on the headstock shaft. The gear should have a convenient number of teeth (30, 60, 90, and 120 teeth are ideal). When mounted in any of the ways shown, the lathe can be indexed accurately for milling, toolpost grinding, and similar uses.

As shown, various kinds of mounting give more or less flexibility to the arrangement, providing indexing to better than ¼-tooth spacing, which, with a 120-tooth gear, gives accurate spacing intervals of 45′. *John M Heath, Kenmore, NY*



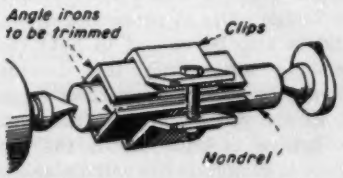
Adjustable Scriber Simplifies Vernier Height Gage Settings

When marking out complicated sample castings to verify machining tolerances or other dimensions, it is often hard to arrange the job so that the datum line is at an even inch measurmeent. This situation can cause possible error and loss of quite a bit of time while the odd datum measure is subtracted from vernier readings to give true measurements.

The adapter shown here is designed to save most of this trouble. It provides a means of adjustment so the initial setting of the height gage is always an integer, so measurements above the datum line are read direct, after subtracting a whole number of inches.

In use, the adapter is adjusted to the next whole inch above the datum dimension, and the setscrew locks the scriber in place. For example, if the datum line is, say, 1.415 in. above the table, the scriber is set to 0.585 in. above the base of the gage, so the vernier reads 2 in.

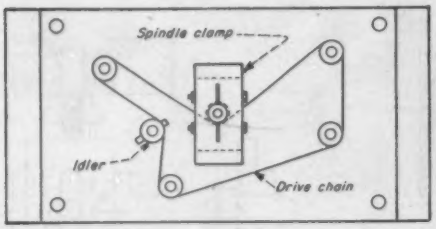
An adjustment of a little more than 1 in. should be provided for, so that if need arises, the adapter can be inverted to avoid overhang or to fit a tight spot. *R H Fry, Croydon, England*

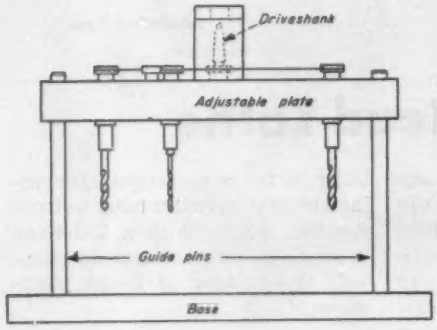


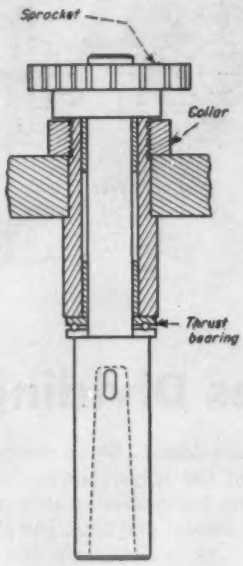
Mandrel Matches Angle Iron

Pieces of angle iron can be made true and of equal length by holding them on a mandrel, as shown.

The work is held on the mandrel with clips. One pair of clips is enough for short pieces, and two clips will hold any normal length of angles. The mandrel should be large enough to keep the edges of the angle iron separated. *W J Morgan, Somerset, England*







Cartridge detail

Cartridge Units for Adjustable Drillhead

When drilling small lots of castings with a number of different hole patterns, we found that the attachment shown will speed the work.

The fixture which does the job consists of an upper and lower plate, kept in line with guide pins which slide in the upper plate. The upper plate is bored out to take cartridge units at proper locations, and is also bored out to hold the bushing supporting the driving shank which has the correct taper to fit the spindle of the drillpress. A bridge is built across the top plate to clamp on the spindle above the quill. This bridge puts the weight of the attachment on the spindle, and the only force on the quill is the torque needed to drive the main sprocket.

We use a number of upper plates, each one bored to suit one or more hole patterns. Cartridges, which are made up as interchangeable units, are put in position in the upper plate, a sprocket is attached, and the threaded collar is screwed into place. Sprocket size determines drill rotational speed, a smaller sprocket giving a higher drill rpm. Ordinary roller chain drives the drills.

The drillpress is run backwards, so most of the drills turn clockwise. Unless several idlers are used, one or more drills will turn backwards, so it is necessary to use left-hand drills.

Work is mounted on the lower plate, using suitable locators and clamps. A sheet metal guard covers the chain drives. *Henry Gifford,*

Tubing Cutoff Method

In Practical Ideas (*AM*—May 10, '54) a way is described to cut off tubing with a special steadyrest. We have found an easier way to do the same job, without resetting any tools, and using standard lathe equipment. Furthermore, our tubing length is not limited to the between-centers distance of our lathe.

We took 14-ft lengths of tubing, 4 in. in diameter, and parted off 3-in. lengths with no trouble, on a 9-in.-swing bench lathe.

The tailstock is removed from the lathe, and put aside. Then the steadyrest is clamped at the end of the bed and adjusted for work diameter. (It can be left a little loose, to avoid marking the work). This will not affect the work accuracy, as the bottom jaws are adjusted to keep the work parallel to the lathe bed, and the top jaw is adjusted for the desired tension.

A parting tool is then set in the cross-slide, at a distance from the chuck to suit the desired length of tubing. This avoids resetting each time a piece is cut off. Also, the cut is made right by the chuck, giving maximum rigidity.

If desired, a second tool can be set on the back toolholder, to permit further turning on the part in the same chucking. The steadyrest only needs resetting once, when the work gets too short to be held in the original place. Only one resetting is needed, to bring the rest to within about a foot of the chuck.

If the work is unusually long, with respect to the length of the lathe bed, an added floor stand can be used to support the extreme outer end of the work. *Albert I Levitt, Bronx, NY*

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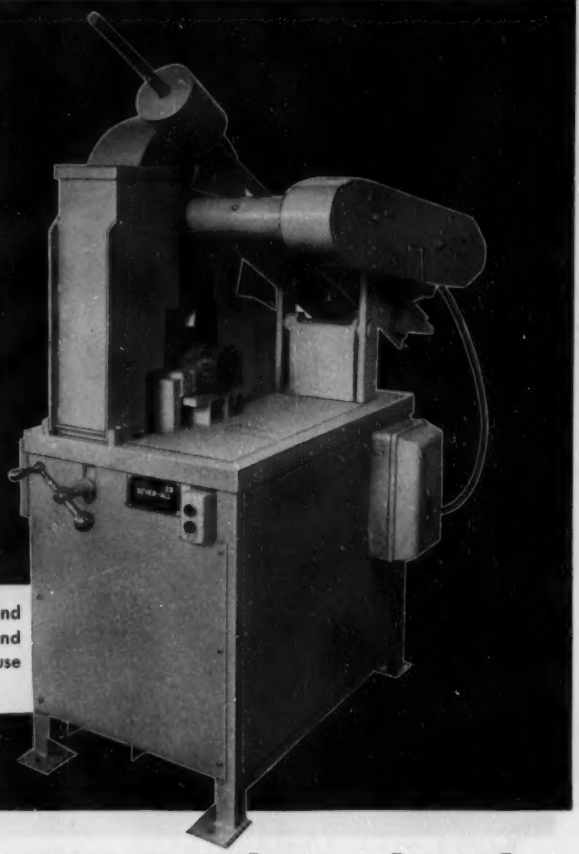
an ACCO product

New Model 28 Campbell Sever-All Dry Cutter

- Compact
- Portable
- Ideal for contract or construction work

CAPACITY: Solids up to 4" x 4" square, angles and channels to 8", tubes and pipes to 4" O.D., 4" angles and channels and 4" O.D. pipe at 45° angles. Based on use of 18" cutting wheel and 10 H.P. motor.



Here's a versatile cutter you can take to the job

• This new CAMPBELL Model 28 SEVER-ALL Abrasive Cutter is a dry-cutting machine which combines the capacity for a wide variety of cutting operations with a compactness which permits a portability seldom found in cutters of its type and capacity. It is ideal for cutting all types of material in contract or construction work. Can be supplied with work stop and with wheels for easy movement from job to job.

From front to back, the SEVER-ALL measures but 56". It is only 32" wide and 62" in height. Other important features include:

1. Work clamped on both sides of cut by hand-operated, self-centering work holders. Can be supplied with foot-operated treadle.

2. Time of cut is approximately 3 seconds per square inch of material.

3. Operator safety provided by complete enclosure of cutting wheel during operation—except for openings to clear the work.

4. Lowering of guard permits accurate location of work, permits long pieces to be placed in machine without threading through.

This Model 28 SEVER-ALL cutter is the newest of a long line of CAMPBELL Abrasive Cutters which provide many exclusive features. CAMPBELL field engineers are conveniently located to consult with you on ALL your cutting problems. Write today for specifications on the SEVER-ALL or **Bulletin DH-301** on the CAMPBELL Abrasive Cutting Method.

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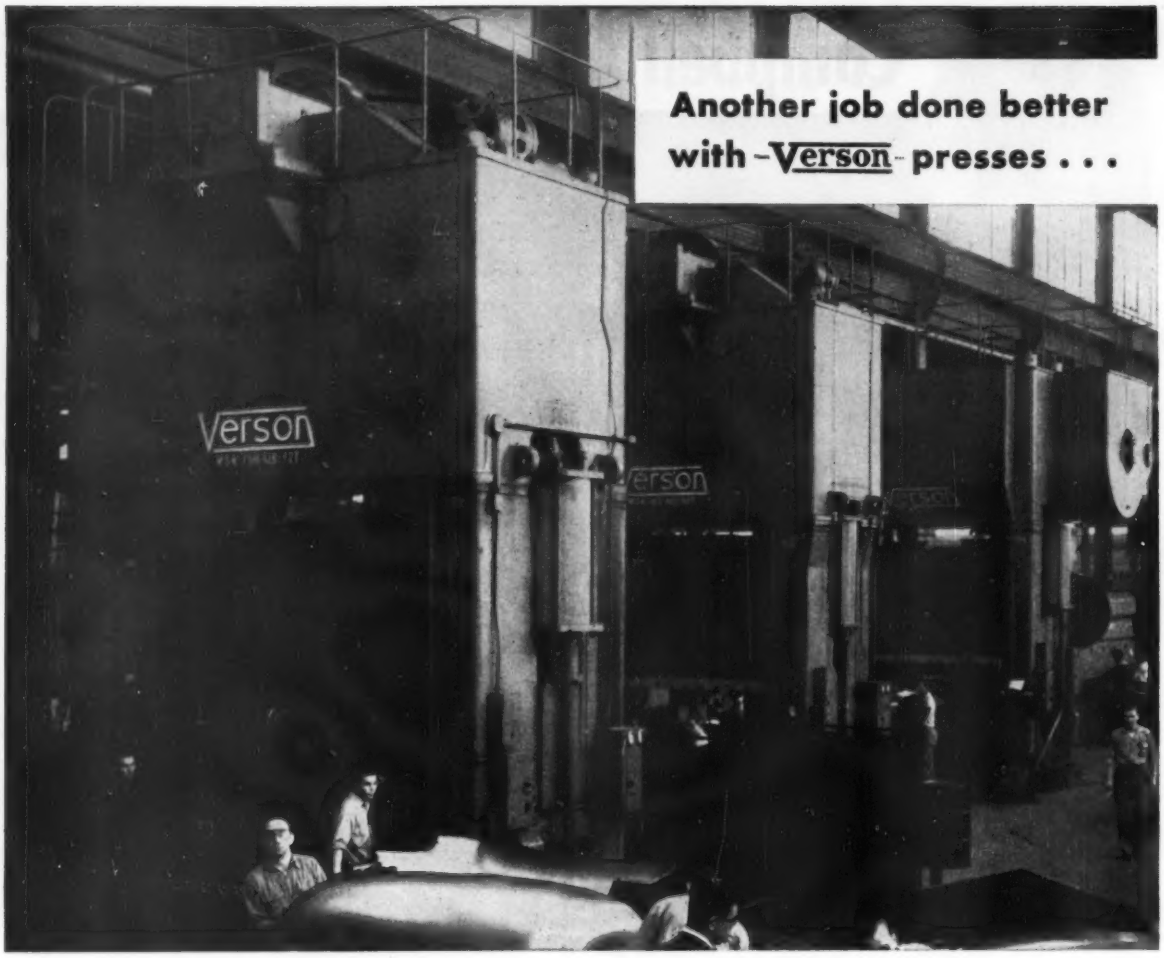
Wet and Dry Cutters and Nibblers



This -Verson- line-up turns out truck cab tops for Morrison Steel Products, Inc.

Typical of the countless routine jobs that are being done better every day with Verson Presses are the truck cab tops manufactured by Morrison Steel Products, Inc. Buffalo, New York. In the line-up shown above are two Verson four point full eccentrics rated at 750 tons and 400 tons and a Verson two point full eccentric of 750 tons capacity.

Nothing outstanding about this installation?

No, except that like so many manufacturers doing routine jobs, Morrison Steel Products has taken advantage of Verson's high standards of performance and economy. For the manufacturer this means better stampings at lower overall cost. This is proved by experience on all kinds of jobs over a period of a third of a century.

Whatever your press needs, whether the job is routine or one-of-a-kind, it will pay you to put Verson's experience and know-how to work for you. Catalog G-52 summarizes the complete Verson line and gives typical specifications. Write for your copy, today. There is no obligation on your part.

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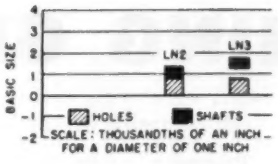
Limits and Fits for Cylindrical Parts... VII

This proposal for an American Standard will be published by the American Society of Mechanical Engineers after acceptance

FIG. 4 . . . Graphical representation of standard locational interference fits shown in Table 6



Allowance. Allowance is a prescribed difference in dimensions of mating parts. It is a minimum clearance (positive allowance) or mixmum interference (negative allowance) between mating parts.

Clearance Fit. A fit between mating parts having limits of size so prescribed that a clearance always results in assembly.

Interference Fit. A fit between mating parts having limits of size so prescribed that an interference always results in assembly.

Transition Fit. A fit between mating parts having limits of size so prescribed as to partially or wholly overlap, so that either a clearance or interference may result in assembly.

Basic Hole System. The basic hole system of fits is a system in which the minimum limit of each hole size is basic. The fit desired is obtained by varying the allowance of the shaft and the tolerances of the mating parts.

Basic Shaft System. The basic shaft system of fits is a system in which the maximum limit of each shaft size is basic. The fit desired is obtained by varying the allowance of the hole and the tolerances of the mating parts.

Preferred Basic Sizes

In specifying fits, the basic size of mating parts shall be chosen from Table 1.

Preferred Series for Tolerances and Allowances

All fundamental tolerances and allowances of all shafts and holes have been taken from the series given in Table 2. All dimensions are given in inches.

Acceptance of Parts

Acceptability. A part shall be acceptable if its actual size does not exceed the limits of size specified in numerical values on the drawing or in writing. It does not meet dimensional specification if its actual size exceeds those limits.

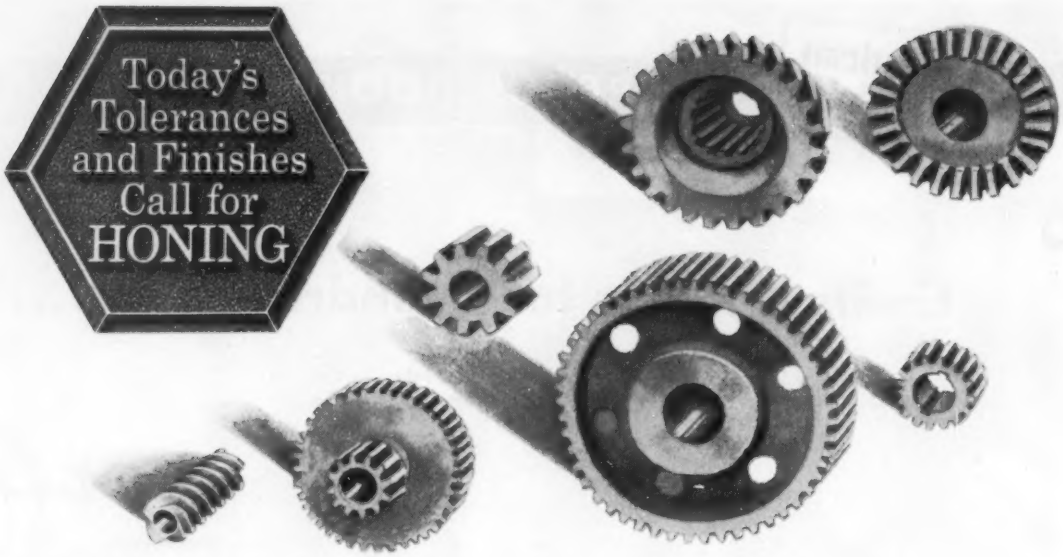
Reference Temperature. The actual size of a part shall be considered to be that size which the part has when it is measured at the International Standard Reference Temperature of 68 F (20 C).

table 6 . . . Interference Locational Fits

Limits are in thousandths of an inch.

Limits for hole and shaft are applied algebraically to the basic size to obtain the limits of size for the parts. Data in bold face are in accordance with ABC agreements.

Nominal Size Range Inches		Class LN 2			Class LN 3		
		Limits of Interference	Standard Limits		Limits of Interference	Standard Limits	
Over	To		Hole	Shaft		Hole	Shaft
0.04–	0.12	0 0.65	+ 0.4 − 0	+ 0.65 + 0.4	0.1 0.75	+ 0.4 0	+ 0.75 + 0.5
0.12–	0.24	0 0.8	+ 0.5 − 0	+ 0.8 + 0.5	0.1 0.9	+ 0.5 0	+ 0.9 + 0.6
0.24–	0.40	0 1.0	+ 0.6 − 0	+ 1.0 + 0.6	0.2 1.2	+ 0.6 − 0	+ 1.2 + 0.8
0.40–	0.71	0 1.1	+ 0.7 − 0	+ 1.1 + 0.7	0.3 1.4	+ 0.7 − 0	+ 1.4 + 1.0
0.71–	1.19	0 1.3	+ 0.8 − 0	+ 1.3 + 0.8	0.4 1.7	+ 0.8 − 0	+ 1.7 + 1.2
1.19–	1.97	0 1.6	+ 1.0 − 0	+ 1.6 + 1.0	0.4 2.0	+ 1.0 − 0	+ 2.0 + 1.4
1.97–	3.15	0.2 2.1	+ 1.2 − 0	+ 2.1 + 1.4	0.4 2.3	+ 1.2 − 0	+ 2.3 + 1.6
3.15–	4.73	0.2 2.5	+ 1.4 − 0	+ 2.5 + 1.6	0.6 2.9	+ 1.4 − 0	+ 2.9 + 2.0
4.73–	7.09	0.2 2.8	+ 1.6 − 0	+ 2.8 + 1.8	0.9 3.5	+ 1.6 − 0	+ 3.5 + 2.5
7.09–	9.85	0.2 3.2	+ 1.8 − 0	+ 3.2 + 2.0	1.2 4.2	+ 1.8 − 0	+ 4.2 + 3.0
9.85–	12.41	0.2 3.4	+ 2.0 − 0	+ 3.4 + 2.2	1.5 4.7	+ 2.0 − 0	+ 4.7 + 3.5
12.41–	15.75	0.3 3.9	+ 2.2 − 0	+ 3.9 + 2.5	2.3 5.9	+ 2.2 − 0	+ 5.9 + 4.5
15.75–	19.69	0.3 4.4	+ 2.5 − 0	+ 4.4 + 2.8	2.5 6.6	+ 2.5 − 0	+ 6.6 + 5.0
19.69–	30.09	0.5 5.5	+ 3 − 0	+ 5.5 + 3.5	4 9	+ 3 − 0	+ 9 + 7
30.09–	41.49	0.5 7.0	+ 4 − 0	+ 7.0 + 4.5	5 11.5	+ 4 − 0	+11.5 + 9
41.49–	56.19	1 9	+ 5 − 0	+ 9 + 6	7 15	+ 5 − 0	+15 +12
56.19–	76.39	1 11	+ 6 − 0	+11 + 7	10 20	+ 6 − 0	+20 +16
76.39–	100.9	1 14	+ 8 − 0	+14 + 9	12 25	+ 8 − 0	+25 +20
100.9–	131.9	2 18	+10 − 0	+18 +12	15 31	+10 − 0	+31 +25
131.9–	171.9	4 24	+12 − 0	+24 +16	18 38	+12 − 0	+38 +30
171.9–	200	4 30	+16 − 0	+30 +20	24 50	+16 − 0	+50 +40



SUNNEN HONING INSURES QUIETER RUNNING GEARS

New processing method makes better gears at lower cost

PROBLEM: To produce gears with perfect concentricity between the pitch diameter and the bore. The elimination of runout and wobble of pitch circle insures uniformly controlled backlash, quiet-running gears, and continuous satisfactory service.

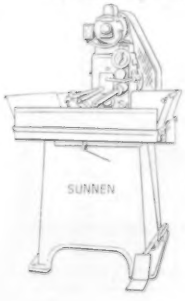
SOLUTION: Many gear manufacturers have solved this problem by changing to this procedure: First, the gear blank bore is Sunnen-honed to a precision fit on the arbor of the gear-cutting machine, *prior to cutting the teeth.* The gear teeth are then generated from this bore. The close fit between bore and arbor insures 100% concentricity of the pitch diameter.

Gears to be hardened are processed in the same way, with the bore being finish-honed after hardening. Original alignment and concentricity are preserved because the bore is self-centering on the honing mandrel.

Precision gears with hardened and ground teeth are processed by the same method, while still soft. After hardening, the bore is finish-honed and the gear teeth are ground concentric, locating from the bore.

Whether you manufacture gears for power drives or small instruments, Sunnen Honing can help you produce quality gears at lower costs. Minimum stock allowance is required, both before and after hardening. Processing costs often show substantial savings over internal grinding.

Sunnen Honing Machines require no fixtures, thus eliminating all chucking distortion. Hole diameter range is $\frac{1}{8}$" to $2\frac{5}{8}$". Average installation costs under $1,000, delivered and in operation within three weeks. Our field engineers continue to serve you year-round without charge. Why not investigate? Write for free booklet now.



FREE BOOKLET shows 105 typical honing jobs—case histories—production rates. Use coupon or post card to get your copy.

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Name.....

Company.....

Address.....

City..... Zone..... State.....

Limits and Fits for Cylindrical Parts... VIII

table 7 . . . Force and Shrink Fits

Nominal Size Range Inches		Class FN 1			Class FN 2			Class FN 3			Class FN 4			Class FN 5		
		Limits of Interference	Standard Limits		Limits of Interference	Standard Limits		Limits of Interference	Standard Limits		Limits of Interference	Standard Limits		Limits of Interference	Standard Limits	
Over	To		Hole	Shaft		Hole	Shaft		Hole	Shaft		Hole	Shaft		Hole	Shaft
0.04–	0.12	0.05	+0.25	+ 0.5	0.2	+ 0.4	+ 0.85				0.3	+ 0.4	+ 0.95	0.5	+ 0.4	+ 1.3
		0.5	− 0	+ 0.3	0.85	− 0	+ 0.6				0.95	− 0	+ 0.7	1.3	− 0	+ 0.9
0.12–	0.24	0.1	+0.3	+ 0.6	0.2	+ 0.5	+ 1.0				0.4	+ 0.5	+ 1.2	0.7	+ 0.5	+ 1.7
		0.6	− 0	+ 0.4	1.0	− 0	+ 0.7				1.2	− 0	+ 0.9	1.7	− 0	+ 1.2
0.24–	0.40	0.1	+0.4	+ 0.75	0.4	+ 0.6	+ 1.4				0.6	+ 0.6	+ 1.6	0.8	+ 0.6	+ 2.0
		0.75	− 0	+ 0.5	1.4	− 0	+ 1.0				1.6	− 0	+ 1.2	2.0	− 0	+ 1.4
0.40–	0.56	0.1	+0.4	+ 0.8	0.5	+ 0.7	+ 1.6				0.7	+ 0.7	+ 1.8	0.9	+ 0.7	+ 2.3
		0.8	− 0	+ 0.5	1.6	− 0	+ 1.2				1.8	− 0	+ 1.4	2.3	− 0	+ 1.6
0.56–	0.71	0.2	+0.4	+ 0.9	0.5	+ 0.7	+ 1.6				0.7	+ 0.7	+ 1.8	1.1	+ 0.7	+ 2.5
		0.9	− 0	+ 0.6	1.6	− 0	+ 1.2				1.8	− 0	+ 1.4	2.5	− 0	+ 1.8
0.71–	0.95	0.2	+0.5	+ 1.1	0.6	+ 0.8	+ 1.9				0.8	+ 0.8	+ 2.1	1.4	+ 0.8	+ 3.0
		1.1	− 0	+ 0.7	1.9	− 0	+ 1.4				2.1	− 0	+ 1.6	3.0	− 0	+ 2.2
0.95–	1.19	0.3	+0.5	+ 1.2	0.6	+ 0.8	+ 1.9	0.8	+ 0.8	+ 2.1	1.0	+ 0.8	+ 2.3	1.7	+ 0.8	+ 3.3
		1.2	− 0	+ 0.8	1.9	− 0	+ 1.4	2.1	− 0	+ 1.6	2.3	− 0	+ 1.8	3.3	− 0	+ 2.5
1.19–	1.58	0.3	+0.6	+ 1.3	0.8	+ 1.0	+ 2.4	0.8	+ 1.0	+ 2.4	1.5	+ 1.0	+ 3.1	2.0	+ 1.0	+ 4.0
		1.3	− 0	+ 0.9	2.4	− 0	+ 1.8	2.4	− 0	+ 1.8	3.1	− 0	+ 2.5	4.0	− 0	+ 3.0
1.58–	1.97	0.4	+0.6	+ 1.4	0.8	+ 1.0	+ 2.4	1.2	+ 1.0	+ 2.8	1.8	+ 1.0	+ 3.4	3.0	+ 1.0	+ 5.0
		1.4	− 0	+ 1.0	2.4	− 0	+ 1.8	2.8	− 0	+ 2.2	3.4	− 0	+ 2.8	5.0	− 0	+ 4.0
1.97–	2.56	0.6	+0.7	+ 1.8	0.8	+ 1.2	+ 2.7	1.3	+ 1.2	+ 3.2	2.3	+ 1.2	+ 4.2	3.8	+ 1.2	+ 6.2
		1.8	− 0	+ 1.3	2.7	− 0	+ 2.0	3.2	− 0	+ 2.5	4.2	− 0	+ 3.5	6.2	− 0	+ 5.0
2.56–	3.15	0.7	+0.7	+ 1.9	1.0	+ 1.2	+ 2.9	1.8	+ 1.2	+ 3.7	2.8	+ 1.2	+ 4.7	4.8	+ 1.2	+ 7.2
		1.9	− 0	+ 1.4	2.9	− 0	+ 2.2	3.7	− 0	+ 3.0	4.7	− 0	+ 4.0	7.2	− 0	+ 6.0
3.15–	3.94	0.9	+0.9	+ 2.4	1.4	+ 1.4	+ 3.7	2.1	+ 1.4	+ 4.4	3.6	+ 1.4	+ 5.9	5.6	+ 1.4	+ 8.4
		2.4	− 0	+ 1.8	3.7	− 0	+ 2.8	4.4	− 0	+ 3.5	5.9	− 0	+ 5.0	8.4	− 0	+ 7.0
3.94–	4.73	1.1	+0.9	+ 2.6	1.6	+ 1.4	+ 3.9	2.6	+ 1.4	+ 4.9	4.6	+ 1.4	+ 6.9	6.6	+ 1.4	+ 9.4
		2.6	− 0	+ 2.0	3.9	− 0	+ 3.0	4.9	− 0	+ 4.0	6.9	− 0	+ 6.0	9.4	− 0	+ 8.0
4.73–	5.52	1.2	+1.0	+ 2.9	1.9	+ 1.6	+ 4.5	3.4	+ 1.6	+ 6.0	5.4	+ 1.6	+ 8.0	8.4	+ 1.6	+ 11.6
		2.9	− 0	+ 2.2	4.5	− 0	+ 3.5	6.0	− 0	+ 5.0	8.0	− 0	+ 7.0	11.6	− 0	+ 10.0
5.52–	6.30	1.5	+1.0	+ 3.2	2.4	+ 1.6	+ 5.0	3.4	+ 1.6	+ 6.0	5.4	+ 1.6	+ 8.0	10.4	+ 1.6	+ 13.6
		3.2	− 0	+ 2.5	5.0	− 0	+ 4.0	6.0	− 0	+ 5.0	8.0	− 0	+ 7.0	13.6	− 0	+ 12.0
6.30–	7.09	1.8	+1.0	+ 3.5	2.9	+ 1.6	+ 5.5	4.4	+ 1.6	+ 7.0	6.4	+ 1.6	+ 9.0	10.4	+ 1.6	+ 13.6
		3.5	− 0	+ 2.8	5.5	− 0	+ 4.5	7.0	− 0	+ 6.0	9.0	− 0	+ 8.0	13.6	− 0	+ 12.0
7.09–	7.88	1.8	+1.2	+ 3.8	3.2	+ 1.8	+ 6.2	5.2	+ 1.8	+ 8.2	7.2	+ 1.8	+ 10.2	12.2	+ 1.8	+ 15.8
		3.8	− 0	+ 3.0	6.2	− 0	+ 5.0	8.2	− 0	+ 7.0	10.2	− 0	+ 9.0	15.8	− 0	+ 14.0
7.88–	8.86	2.3	+1.2	+ 4.3	3.2	+ 1.8	+ 6.2	5.2	+ 1.8	+ 8.2	8.2	+ 1.8	+ 11.2	14.2	+ 1.8	+ 17.8
		4.3	− 0	+ 3.5	6.2	− 0	+ 5.0	8.2	− 0	+ 7.0	11.2	− 0	+ 10.0	17.8	− 0	+ 16.0
8.86–	9.85	2.3	+1.2	+ 4.3	4.2	+ 1.8	+ 7.2	6.2	+ 1.8	+ 9.2	10.2	+ 1.8	+ 13.2	14.2	+ 1.8	+ 17.8
		4.3	− 0	+ 3.5	7.2	− 0	+ 6.0	9.2	− 0	+ 8.0	13.2	− 0	+ 12.0	17.8	− 0	+ 16.0
9.85–	11.03	2.8	+1.2	+ 4.9	4.0	+ 2.0	+ 7.2	7.0	+ 2.0	+ 10.2	10.0	+ 2.0	+ 13.2	16.0	+ 2.0	+ 20.0
		4.9	− 0	+ 4.0	7.2	− 0	+ 6.0	10.2	− 0	+ 9.0	13.2	− 0	+ 12.0	20.0	− 0	+ 18.0
11.03–	12.41	2.8	+1.2	+ 4.9	5.0	+ 2.0	+ 8.2	7.0	+ 2.0	+ 10.2	12.0	+ 2.0	+ 15.2	18.0	+ 2.0	+ 22.0
		4.9	− 0	+ 4.0	8.2	− 0	+ 7.0	10.2	− 0	+ 9.0	15.2	− 0	+ 14.0	22.0	− 0	+ 20.0
12.41–	13.98	3.1	+1.4	+ 5.5	5.8	+ 2.2	+ 9.4	7.8	+ 2.2	+ 11.4	13.8	+ 2.2	+ 17.4	19.8	+ 2.2	+ 24.2
		5.5	− 0	+ 4.5	9.4	− 0	+ 8.0	11.4	− 0	+ 10.0	17.4	− 0	+ 16.0	24.2	+ 0	+ 22.0
13.98–	15.75	3.6	+1.4	+ 6.1	5.8	+ 2.2	+ 9.4	9.8	+ 2.2	+ 13.4	15.8	+ 2.2	+ 19.4	22.8	+ 2.2	+ 27.2
		6.1	− 0	+ 5.0	9.4	− 0	+ 8.0	13.4	− 0	+ 12.0	19.4	− 0	+ 18.0	27.2	− 0	+ 25.0
15.75–	17.72	4.4	+1.6	+ 7.0	6.5	+ 2.5	+ 10.6	9.5	+ 2.5	+ 13.6	17.5	+ 2.5	+ 21.6	25.5	+ 2.5	+ 30.5
		7.0	− 0	+ 6.0	10.6	− 0	+ 9.0	13.6	− 0	+ 12.0	21.6	− 0	+ 20.0	30.5	− 0	+ 28.0
17.72–	19.69	4.4	+1.6	+ 7.0	7.5	+ 2.5	+ 11.6	11.5	+ 2.5	+ 15.6	19.5	+ 2.5	+ 23.6	27.5	+ 2.5	+ 32.5
		7.0	− 0	+ 6.0	11.6	− 0	+ 10.0	15.6	− 0	+ 14.0	23.6	− 0	+ 22.0	32.5	− 0	+ 30.0
19.69–	24.34	6.0	+2.0	+ 9.2	9.0	+ 3.0	+ 14.0	15.0	+ 3.0	+ 20.0	22.0	+ 3.0	+ 27.0	32.0	+ 3.0	+ 38.0
		9.2	− 0	+ 8.0	14.0	− 0	+ 12.0	20.0	− 0	+ 18.0	27.0	− 0	+ 25.0	38.0	− 0	+ 35.0
24.34–	30.09	7.0	+2.0	+10.2	11.0	+ 3.0	+ 16.0	17.0	+ 3.0	+ 22.0	27.0	+ 3.0	+ 32.0	37.0	+ 3.0	+ 43.0
		10.2	− 0	+ 9.0	16.0	− 0	+ 14.0	22.0	− 0	+ 20.0	32.0	− 0	+ 30.0	43.0	− 0	+ 40.0
30.09–	35.47	7.5	+2.5	+11.6	14.0	+ 4.0	+ 20.5	21.0	+ 4.0	+ 27.5	31.0	+ 4.0	+ 37.5	46.0	+ 4.0	+ 54.0
		11.6	− 0	+10.0	20.5	− 0	+ 18.0	27.5	− 0	+ 25.0	37.5	− 0	+ 35.0	54.0	− 0	+ 50.0
35.47–	41.49	9.5	+2.5	+13.6	16.0	+ 4.0	+ 22.5	24.0	+ 4.0	+ 30.5	36.0	+ 4.0	+ 43.5	56.0	+ 4.0	+ 64.0
		13.6	− 0	+12.0	22.5	− 0	+ 20.0	30.5	− 0	+ 28.0	45.5	− 0	+ 40.0	64.0	− 0	+ 60.0

DO YOU HAVE ANY QUESTIONS ABOUT LEAD-TREATED STEELS?

QUESTION	ANSWER
What is a lead-treated alloy steel ?	It is an alloy steel made to any standard specification but with the addition of lead, usually in the range of 0.15—0.35%.
What special advantages does the lead addition impart to the alloy steel . . . . . ?	It improves the machinability, increases productivity and reduces costs.
In what qualities and forms are lead-treated alloy steels available ?	Any Aristoloy steel can be made with a lead addition and supplied in any of our standard sections.
Does the lead addition influence in any way the heat treatment of alloy steels . . . . . ?	No. A lead-treated alloy steel responds to heat treatment in exactly the same way as its counterpart without lead.
Does the lead addition affect the mechanical properties of alloy steels . . . . . ?	The addition of lead to any steel does not materially affect its mechanical properties.
What are the machining properties of a lead-treated alloy steel . ?	Lead-treated Aristoloy steels cut more freely than standard alloy steels, and yield a better surface finish even at higher cutting speeds. Of equal, if not greater, importance is the fact that these steels are less severe on the cutting tools.
ARISTOLOY STEELS Where are lead-treated alloy steels most suitably applied ?	Lead-treated Aristoloy steels show to greatest advantage when subjected to complicated or extensive machining operations, or *where it is necessary to machine in the higher ranges of tensile strengths.*

COPPERWELD STEEL COMPANY (Steel Division) **WARREN, OHIO**

Limits and Fits for Cylindrical Parts... IX

table 7 (Continued) . . . Force and Shrink Fits

Limits are in thousandths. Limits for hole and shaft are applied algebraically to the basic size to obtain limits of size for the parts. Data in bold face are in accordance with ABC agreements

Limits are in thousandths of an inch.

Limits for hole and shaft are applied algebraically to the basic size to obtain the limits of size for the parts.

Nominal Size Range Inches		Class FN 1			Class FN 2			Class FN 3			Class FN 4			Class FN 5		
		Limits of Interference	Standard Limits		Limits of Interference	Standard Limits		Limits of Interference	Standard Limits		Limits of Interference	Standard Limits		Limits of Interference	Standard Limits	
Over	To		Hole	Shaft		Hole	Shaft		Hole	Shaft		Hole	Shaft		Hole	Shaft
41.49–	48.28	11.0	+ 3.0	+16.0	17.0	+ 5.0	+ 25.0	30.0	+ 5.0	+ 38.0	45.0	+ 5.0	+ 53.0	65.0	+ 5.0	+ 75.0
		16.0	− 0	+14.0	25.0	− 0	+ 22.0	38.0	− 0	+ 35.0	53.0	− 0	+ 50.0	75.0	− 0	+ 70.0
48.28–	56.19	13.0	+ 3.0	+18.0	20.0	+ 5.0	+ 28.0	35.0	+ 5.0	+ 43.0	55.0	+ 5.0	+ 63.0	75.0	+ 5.0	+ 85.0
		18.0	− 0	+16.0	28.0	− 0	+ 25.0	43.0	− 0	+ 40.0	63.0	− 0	+ 60.0	85.0	− 0	+ 80.0
56.19–	65.54	14.0	+ 4.0	+20.5	24.0	+ 6.0	+ 34.0	39.0	+ 6.0	+ 49.0	64.0	+ 6.0	+ 74.0	94.0	+ 6.0	+106
		20.5	− 0	+18.0	34.0	− 0	+ 30.0	49.0	− 0	+ 45.0	74.0	− 0	+ 70.0	106	− 0	+100
65.54–	76.39	18.0	+ 4.0	+24.5	29.0	+ 6.0	+ 39.0	44.0	+ 6.0	+ 54.0	74.0	+ 6.0	+ 84.0	114	+ 6.0	+126
		24.5	− 0	+22.0	39.0	− 0	+ 35.0	54.0	− 0	+ 50.0	84.0	− 0	+ 80.0	126	− 0	+120
76.39–	87.79	20.0	+ 5.0	+28.0	32.0	+ 8.0	+ 45.0	52.0	+ 8.0	+ 65.0	82.0	+ 8.0	+ 95.0	132	+ 8.0	+148
		28.0	− 0	+25.0	45.0	− 0	+ 40.0	65.0	− 0	+ 60.0	95.0	− 0	+ 90.0	148	− 0	+140
87.79–	100.9	23.0	+ 5.0	+31.0	37.0	+ 8.0	+ 50.0	62.0	+ 8.0	+ 75.0	92.0	+ 8.0	+105	152	+ 8.0	+168
		31.0	− 0	+28.0	50.0	− 0	+ 45.0	75.0	− 0	+ 70.0	105	− 0	+100	168	− 0	+160
100.9–	115.3	24.0	+ 6.0	+34.0	40.0	+10.0	+ 56.0	70.0	+10.0	+ 86.0	110	+10.0	+126	170	+10.0	+190
		34.0	− 0	+30.0	56.0	− 0	+ 50.0	86.0	− 0	+ 80.0	126	− 0	+120	190	− 0	+180
115.3–	131.9	29.0	+ 6.0	+39.0	50.0	+10.0	+ 66.0	80.0	+10.0	+ 96.0	130	+10.0	+146	190	+10.0	+210
		39.0	− 0	+35.0	66.0	− 0	+ 60.0	96.0	− 0	+ 90.0	146	− 0	+140	210	− 0	+200
131.9–	152.2	37.0	+ 8.0	+50.0	58.0	+12.0	+ 78.0	88.0	+12.0	+108	148	+12.0	+168	208	+12.0	+232
		50.0	− 0	+45.0	78.0	− 0	+ 70.0	108	− 0	+100	168	− 0	+160	232	− 0	+220
152.2–	171.9	42.0	+ 8.0	+55.0	68.0	+12.0	+ 88.0	108	+12.0	+128	168	+12.0	+188	238	+12.0	+262
		55.0	− 0	+50.0	88.0	− 0	+ 80.0	128	− 0	+120	188	− 0	+170	262	− 0	+250
171.9–	200	50.0	+10.0	+66.0	74.0	+16.0	+100	124	+16.0	+150	184	+16.0	+210	284	+16.0	+316
		66.0	− 0	+60.0	100	− 0	+ 90	150	− 0	+140	210	− 0	+200	316	− 0	+300

Selection of Fits

In selecting limits of size for any application, the type of fit is determined first, based on the use of service required from the equipment being designed; then the limits of size of the mating parts are established, to insure that the desired fit will be produced. The small number of standard fits shown herein should cover most applications.

Standard Fits

Tables 3 to 7 have been developed to give a series of standard types and classes of fits on a unilateral hole basis, such that the fit produced by mating parts in any one class will produce approximately similar performance throughout the range of sizes. These tables prescribe the fit for any given size, or type of fit; they also prescribe the standard limits for the mating parts which will produce the fit.

In developing Tables 3 to 7 it has been recognized that any fit will usually be required to perform one of three functions, as indicated by the three general types of fits: running fits, locational fits, and force fits.

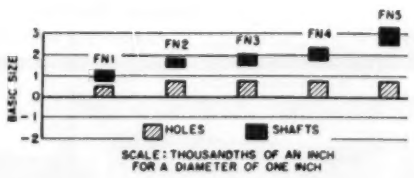

FIG. 5 ... Graphical representation of standard force or shrink fits shown in Table 7

The fits listed in Tables 3 to 7 contain all those in the approved ABC proposal but have been extended to include a wider range of sizes. Fits in exact agreement with the proposal are shown in boldface type.

(To be continued)

NOW Cut Your Carbide Tooling Costs in Half!

See chart below to determine how much you can save.

New V-R Toolholder for "Throw-Away" blanks is available either with Negative Rake or Neutral Rake. Styles are available for triangular, square and round "Throw-Away" blanks.

with V-R Toolholders* and "Throw-Away" Blanks!

- No Chipbreaker Grinding
- Lower Tool Inventory
- Available with Negative or Neutral Rake
- No Carbide Grinding
- Cutting Edge Automatically Positioned
- Another Cutting Edge Quickly Available

More Economical Than Brazed Tools

Compare The Cost Per Cutting Edge...

The costs on a brazed tool's useable cutting edges are:

1. Original cost of the tool
2. Cost of each regrind
3. Number of regrinds obtainable

Formula for computing cost per cutting edge

$$\frac{\text{(Cost of Tool)} + \text{(No. of regrinds} \times \text{cost per grind)}}{\text{Number of regrinds} + 1 \text{ (for original tool)}} = \text{Cost per cutting edge}$$

Compute the cost per cutting edge for a typical brazed tool you use and compare it with cost per cutting edge of a "Throw-Away" blank!

V-R "Throw-Away" Blank Cost Per Cutting Edge

"Throw-Away" Blank Style and Size	Triangular				Square		Round	
	¼"IC	⅜"IC	½"IC	⅝"IC	⅜"sq	½"sq	⅜"	½"
Utility Class for NEGATIVE RAKE Type	.06	.10	.20	.33	.07	.15	..	..
UTILITY Class for NEUTRAL RAKE Type	.12	.20	.40	.66	.15	.30	..	..
PRECISION Class for NEGATIVE RAKE Type	.10	.17	.27	.42	.13	.23	.06	.11
PRECISION Class for NEUTRAL RAKE Type	.20	.34	.54	.84	.27	.47	.16	.26

V-R Toolholders are also available for holding triangular, square and round inserts up to 1½" long. See Toolholder Catalog VR-435.

Write Today for New Toolholder Catalog and Price List VR-436

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CEMENTED CARBIDES • TANTUNG CAST ALLOYS • VASCOLOY-RAMET CORPORATION • V-R

*Patent Pending

Talking Shop . . .

Learn to Wash

SKIN INFECTIONS, lost time and accidents all result from worker failure to wash often enough. Proper work clothing and adequate facilities are the answer. Proper washing setups, hot water, a good soap, and hand cream to replace skin oils washed out all play their part in saving you money.

Soviet Tools

ACCORDING TO REPORTS, Soviet Russia had 700,000 machine tools before World War II, lost 175,000 during the war, but by 1950 had 1,400,000. The rise has been geometric since then; 1800 new types have been brought into production in the last three years, 700 last year alone. But some of these may not be "machine tools" in our sense — one makes meat balls and another rissoles, according to reports. And the Gorky machine-tool plant (larger output than all of Russia in Czarist times) was patterned after "a milling-machine factory in Cincinnati", while the Gorky Molotov Automobile Works was modelled on our Rouge plant of Ford.

Reversed Chart

CHATWOOD SAFE & ENGRG CO, LTD, 1000-man English safe, steel partition, and special-machinery company, tossed out five years ago what is generally known as "scientific management" and saved £15,000 a year in paperwork as a starter. First priority on changes was to cut overhead by inverting the organization chart, by considering the worker as most important. Each management level helps that normally considered "beneath" it; there are no planning departments, no ratefixers, personnel dept, maintenance foreman, or inspection specialists. There are no time clocks — simply a day sheet which each man keeps. The foreman runs his own show, with such specialists as he feels he needs (even including his own draftsmen for special designs and his own inspectors).

Management is by "looking," not by figures from reports and paperwork. There are close budgets (they work out within 3%), but no detailed cost analyses. Authority is delegated: the managing director has five aides, responsible for sales, accounting, purchasing, technical design and development, and production. Each handles his own job; the managing director sees each but does not bypass them under any conditions. Senior foremen each handle a product, have no more than eight foremen reporting to them. Foremen have no more than 25 to 30 men and each does his own employing and rate-setting. In fact, each operates as a subcontracting business, helping on his budget, ordering his own materials through Purchasing, shifting work outside capacity of his available equipment to another foreman on a bid basis. Inso far as possible, each foreman handles a product, too, small though it may be.

Actually, there is no stock control nor stock records — supplies are ordered as a housewife does and as the foreman decides. Steel, for example, is color-marked for the ordering foreman although it may be centrally stocked temporarily. Tools, jigs and fixtures, as well as indirect labor and materials, overtime, maintenance and repairs, come out of the senior foreman's budget; capital expenditures out of the works manager's (on the basis of who can show best return). There is a group bonus system, handled by each foreman, as is maintenance, except for electrical work (where a specialist suggests but the foreman decides) and machine tools (where the maker's man is called in periodically to check up).

Foremen are not supermen — just well-trained shop men with a commercial point of view added. The plan is too new for any foreman to have had it all, but they will eventually have had a 5-year apprenticeship (with day college work), military service, then a 5-year graduate course consisting of half a year in the shops and half a year in other departments or companies. Some even are sent abroad. The object is to provide a pool of potential foremen, for some will inevitably be lost. But the foreman must work his way up; there'll be no "wonder-boy" outsiders or fast-rising college graduates.

Chips in Vaseline

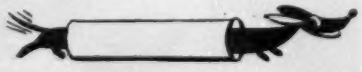
TO MACHINE RADIOSOTOPES, hooded or water-covered machine tools are used (*AM*—Apr 12). But dust may collect in hoods or ducts, or a considerable amount of water may be contaminated. And, in either case, chips and dust are lost, so cannot be measured accurately for radioactivity. Now come M Simnad and P Shewman of the Metals Resarch Lab at Carnegie Institute. They suggest coating the surface of the radioactive material, after it is placed in a lathe, with a thin layer of vaseline. Then a beaker is set below the sample. Chips stick to the vaseline and drop into the beaker. An organic solvent will remove the vaseline, the solution is filtered, and the sample left on the filter paper can be measured for radioactivity.

CI Die?

PIERCING DIES for spun-aluminum reflectors and similar parts have been made successfully of cast iron. Such a die can handle a short run successfully, and tremendously cuts cost.

Skin Thread

ELECTRICAL-FITTING CASTINGS, either aluminum or CI, are now commonly threaded directly from the casting, usually with carbide-tipped cutters that both take out the skin and put it in the threads. One way is on a planetary miller. A 5-in.-dia, Class II thread, 1¼-in. deep can be cut in 30 sec. Cutters have 7° back relief, 5 to 7° face angle. Millers are modified for independent adjustment of feeds and speeds through gear shifts.



Forerunner

A DACHSHUND, with a string on her leash, did a yeoman job recently. She went through section after section of welded pipe 320 ft long. The string, once through the pipe, was used to pull in a cable and then a crawler carrying cobalt to radiograph the welds. Incentive for the dog? Her owner, at the other end of the pipe, waving a wiener.

News of Metalworking . . .

THE NEW TAX LAWS: After 20 Years

Industrial expansion will get a tremendous boost from the new tax depreciation laws—laws that give management freer rein in deciding how fast to use its depreciation reserves for tax purposes

WASHINGTON — The new tax law passed by Congress — the first major wholesale revision of the Tax Code in 75 years — is designed to encourage business management to step in and order new plant and equipment — something the machine tool industry has been advocating for years — mainly through incentives that make it possible to take bigger tax deductions on new production equipment.

This, in effect, is what the new rules say to management: investments made after December 31, 1953, can be recovered out of otherwise taxable income, at a faster pace than has been permitted for the last 20 years. In other words, management gets more freedom to decide how fast it wants to use its depreciation reserves for tax purposes.

To business, depreciation reserves are the greatest single source of new investment — greater by $2 billion than retained profits in 1953, and greater by $4.2 billion than the value of all stocks and bonds issued that year to raise new funds. For 20 years, businessmen have fumed about the way the tax laws handled depreciation.

The new tax bill is designed to undo some of the buckles on the straightjacket created by Bulletin F and TD 4422. What Congress has done is to give explicit approval to the declining balance method (example: if a machine valued at $10,000 is depreciated over 10 years, $1000 is written off the first year, $9000 the second year, $8100 the third year, until the 10 years is up) and the sum-of-the digits method (example: where estimated useful life of the machine is five years, the sum of the yearly digits is 15 (1 plus 2 plus 3 plus 4 plus 5), and for the first year 5/15 of cost is permitted as depreciation, for the second year 4/15, third year 3/15, etc.).

Congress has authorized the use of declining balance at double the straight-line rates (that means 10% for the 20-year asset instead of 5%) — and it has approved any other method that doesn't exceed the results you would get with the declining balance method.

This simple idea becomes a power-

5000 entries of US youngsters . . .

turned up everything . . .

Ingenuity + Youth = Tomorrow's Craftsmen

SOME OF THE ENTRIES IN THE MACHINE SHOP DIVISION — characteristic of the wide diversity of interest on the part of budding machinists — include high-speed drills, tap wrenches, bench grinders, center punches

TEEN-AGE TOOLMAKER is 17-year-old entrant Bruce Freeman, son of a machine-tool maintenance man

US Business Gets a Break on Depreciation

ful tool when used deliberately by government to create economic expansion. You saw it in full force during the Korean War build-up, when thousands of companies got some 20,000 "Certificates of Necessity," under which they were permitted to pile up depreciation reserves faster than the tax rules otherwise allowed. The theory was that we needed a vastly expanded economic base to back up mobilization needs — and that the right depreciation incentive would do the trick. Business men learned then that fast depreciation made it a lot easier and safer to expand. Adopted to the needs of peacetime growth, Republicans borrowed this policy as the heart of their new tax law. And they have added some new twists of their own. For example:

• A company may start using the declining balance method, and then switch to straight-line at any time it desires.

• A taxpayer can, if he likes, use a combination of straight-line rates to get something similar to the declining balance method. For example, in a 20-year asset, he might use a 6% writeoff for the first 10 years, and 4% for the last 10 years. This averages out to the approved 5%.

All in all, the effect will be to let business charge off a substantially larger part of new investment in the early years of its life — provided that's what business wants.

But not everybody will want to take advantage of the new rules— business may tread warily in the matter of faster writeoffs. Slugging a heavy charge for depreciation into the early years of a new asset's life has its drawbacks, too:

• Depreciation taken now can't be taken again later. In the long run, you don't save taxes, you postpone them.

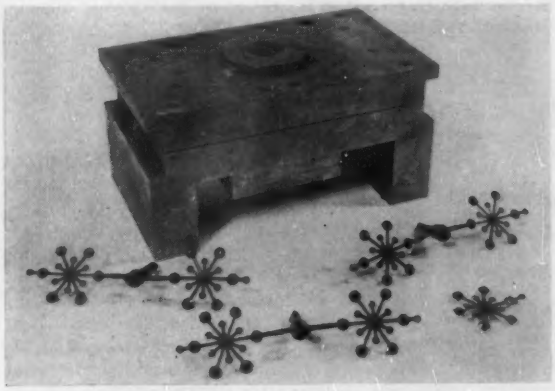
• Was last year's business decline the forerunner of a full-scale recession? Then caution is the word.

• Is your company in a growth industry? If so, the new rules are plainly attractive. If no, look again.

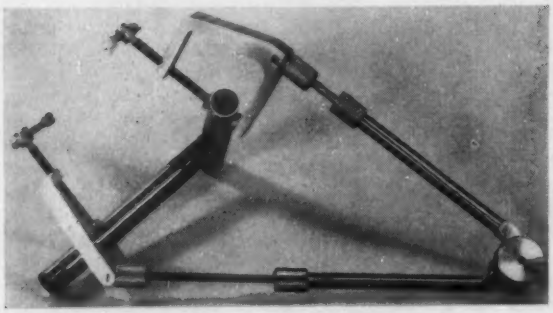
• Are your profits likely to be greater in five years than they are now? If so, it might be smarter to stick by the old rules.

• Will your shareholders stand for the lower profits that could result if you adopt the new depreciation formulas? Larger depreciation allowances show up on corporation books as a greater cost of doing business — and as a greater offset against profits. The big institutional investors will understand. But what about Aunt Jane?

What it comes down to is this: some companies will embrace the new rules joyfully: others will never take advantage of them. The decision in each case will have to be made with future profits, expansion plans, growth trends, stockholder sentiment and other factors in mind.



from plastic injection molds . . .



to a universal welding clamp

FORD INDUSTRIAL ARTS COMPETITION ENCOURAGES KIDS WITH A MECHANICAL BENT

DETROIT — A fair share of the younger generation is preparing itself to answer industry's call for more skilled workers — if the number and quality of entries in this year's Ford Motor Co Industrial Arts Awards Competition is any indication.

More than 5000 entries ended up in this year's final competitions at Greenfield Village, Dearborn, Mich. Eligible: any boy or girl in grades 7 through 12, or any project made in school under supervision of an industrial arts or trade instructor.

Noteworthy among this year's Machine Shop Division entries were:

The plastic injection mold (shown at top left) that turns out the "snowflakes" pictured. The work of a St Paul, Minn, vocational school student, it took first prize, is valued at $5000.

The multi-position welding clamp (bottom left) that won a $100 ingenuity award and a $60 third place award for a New Jersey student. Its multiple joints and flexibility enable the clamp to hold a tube and workpieces at practically any position. The young inventor has been urged to patent it.

Senate Blasts US Defense Buying Abroad

Is the US wasting money that could be spent at home by buying obsolete planes abroad? The Senate thinks so

WASHINGTON — The Senate Appropriations Committee has let loose a blast at the government's offshore purchase of $750 millions worth of British aircraft, declaring that we are not only buying obsolete types of fighters and bombers—such offshore procurement is to the detriment of US strategic industries.

In 1955, about $225 million will be spent on modernization of Britain's Royal Air Force and in support of Britain's NATO aircraft contributions. The committee feels that a large part of these funds will directly or indirectly support the English jet transport industry—at the expense of the US aircraft industry.

The administrative judgment excercised by the Economic Cooperation Agency, Mutual Security Agency, and Foreign Operations Agency is open to serious question, the committee says, because of:

- The obligation of funds for procurement of several thousand expensive machine tools without proper screening or end-use checks.
- Failure to keep track of disposition of the tools for a long period after they were delivered to Britain's Ministry of Supply .
- Failure to inspect the tools at the British plants to which they were allocated.
- Failure to negotiate any agreement with Britain's Ministry of Supply regulating use and distribution of the tools for nearly 3 years.
- A commitment to finance procurement of British military aircraft that have not been evaluated or approved by the USAF.
- A commitment to finance British military aircraft that will have only 12-18 months' front-line service before retirement.
- A commitment to enter into offshore procurement contracts for military aircraft with the British Ministry of Supply instead of the manufacturers — making it "impossible to control costs."

Industrial Betatron for Detroit Arsenal

HEAVY METAL SECTION FROM 3 TO 20 IN. THICK can be radiographically examined at Detroit Arsenal Laboratories with this GE 15 MEV industrial betatron. Previously, 5-in. steel was thickest that could be penetrated with the Arsenal's radiographic equipment. Specially designed synchronization unit will soon be attached to the betatron to permit examination of fast-moving objects, such as a tank engine operating at about 3000 rpm

Britons Buy Canadian Tool Firm

England's John Brown Co Ltd adds machine-tool and tungsten-carbide firm to its Canadian Interests

TORONTO—John Brown & Co Ltd, Sheffield, England, has acquired control of A C Wickman (Canada) Ltd and has formed a new company, A C Wickman Ltd, with initial capital of $2 million. Wickman specializes in high-production machine tools and in tungsten carbide and ancillary production equipment.

Adds to Present Canadian Interests

This acquisition represents a further important phase in John Brown's interests in Canada, which consist of Firth Brown Steels Ltd (handling special corrosion and heat resisting steels) and Firth Brown Tools (Canada) Ltd (cutting tools). The John Brown company built the "Queen Mary" and "Queen Elizabeth" at its shipyards in Scotland.

W T Muirhead, now in his twenty-fifth year of service with companies bearing the A C Wickman name, will be president and general manager of the new company. Born in Nova Scotia and having spent most of his life in Scotland, Mr Muirhead went to Canada in 1940 as managing director of the A C Wickman (Canada) Ltd at the time of its formation. He is now in his second term as president of the Canadian Machine Tool Dealers Association.

Lord Aberconway, board chairman of John Brown, will be chairman of Wickman, with Eric Mensforth as deputy chairman. The latter was chief production advisor to the Ministry of Aircraft Production during the war. Other Wickman officials are: L C West, vice president and assistant general manager; L B Manning, sales manager; and P H White, works manager.

QUICK FEDERAL SPENDING:

Is It the Push That Will Start the Business Swing Upward?

A fast loosening of federal purse strings now, and a cutback later when business can stand it better—that's the administration's way of giving US business "a little nudge"

WASHINGTON—A solid increase in federal spending and ordering—much of it for hard goods—has been ordered by the Eisenhower administration in the hope of speeding the business up-turn.

The goal is to pump out money and orders in the current July-September quarter at a higher rate than for the rest of the fiscal year, which ends next June 30.

Here are the programs picked out for special stimulation:

• Aircraft: Air Force officials are pushing out $1 billion worth of new contracts, most of them in the current quarter. This breaks a long drought, during which new contracts were held to a minimum. A good part of this money is for North American F-100 Supersabre jet fighters.

• Tanks and troop carriers: the Army announced a 12-month extension of $266 million worth of contracts for Army vehicles, mostly tanks and troop carriers. This assures production up to mid-1956. Most of the work is for Detroit.

•Navy: a fourth super-carrier of the Forrestal class will be built in the Brooklyn Naval Shipyard. Two additional atom-powered submarines are also planned.

• Shipping: American President Lines will spend $65.8 million building two new combination passenger-freight vessels, and in purchasing four ships from the Maritime Commission. Two of the to-be-purchased vessels will be remodeled. The government's share of the construction comes to $12.8 million, granted in the form of a subsidy to equalize shipbuilding costs between US and foreign yards.

• Highways: $875 million of federal aid to states has been apportioned six months ahead of the original schedule. In addition, $2 billion has been appropriated for roads in the fiscal years beginning July 1 1955 and July 1, 1956.

• Airports: the administration expects to get Congressional approval for $22 million worth of grants to cities, which have a total of $130 million ready to spend. Apportionment of the federal money is expected by September.

Policy Is "Deliberate"

Disclosure that all this adds up to a deliberate administration policy was made by Commerce Secretary Weeks, who said spending and ordering are being increased in the July-September quarter "to give the economy a little nudge." The business outlook is bright and will be made even brighter by this program, he said.

The program does not mean a rise in the spending programs for the year as a whole. Any excess in spending this quarter will have to be matched by reductions later on. But administration economists think now is the time to nudge business—just as business seems to be improving under its own steam. Then, when the federal flow of spending is reduced later on, business growth will absorb the difference.

Biggest Aluminum Drawn Tubes?

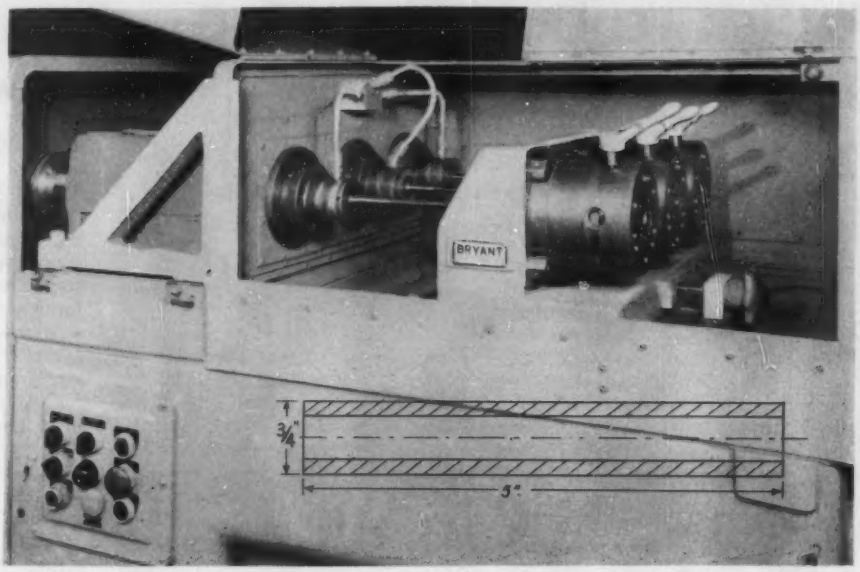
. . . THAT'S WHAT ENGLAND'S JAMES BOOTH & CO CLAIMS for tubes like the one shown being drawn here. When the drawbench and auxiliary equipment reach maximum production capacity, Booth expects to draw tubes with up to 17-in. OD as long as 35 ft, but for tubes with thick wall, length may be limited by maximum weight, which at present is about 300 lb

POTTER & JOHNSTON BUYS NEWARK GEAR

NEWARK, NJ—Newark Gear Inc of this city, manufacturers of gear hobbing, cutting, testing and cutter grinding machines and attachments, has been acquired by Potter & Johnston Co, Pawtucket, RI, subsidiary of Pratt & Whitney, Division Niles-Bement-Pond Co.

Sales and service for Newark gear machines will be handled by Pratt & Whitney sales division's branches.

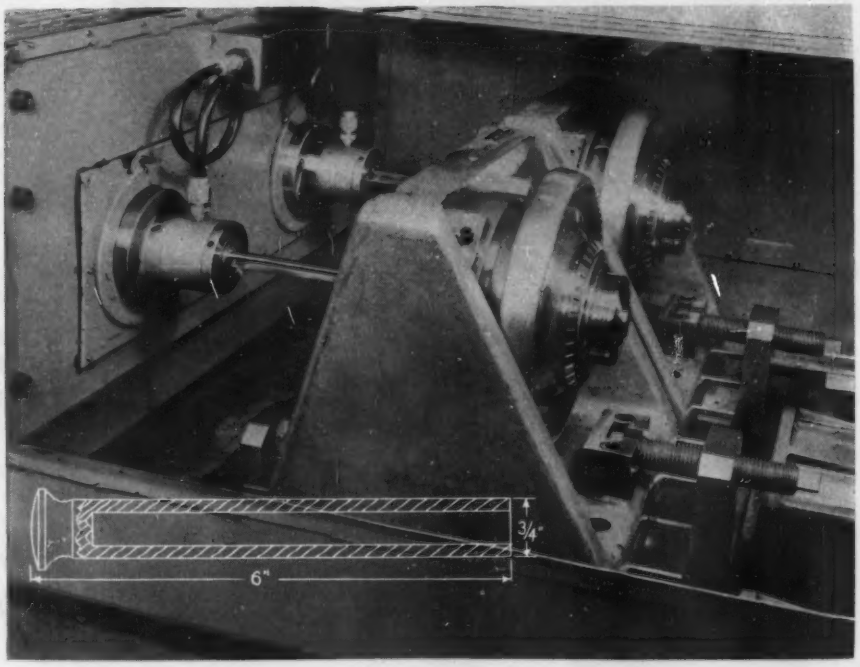
Through hole in titanium alloy . . . A Ti-alloy bar, ¾-in. dia x 5-in. long, ground all over and with as-drawn hardness of R_c30 max, is converted to a tube by precision drilling at a rate of 22 pc per hr (100%) on a 3-spindle machine. Hole must be 0.450 to 0.460 in. dia, to a 75-or-better mu in. rms finish. By precision drilling, the holes are made at 1400 rpm (170 sfpm) and 0.70-ipm feed (0.0005 ipr). Three A & C Hydra-Lock chucks on an angle-type fixture hold the pieces, and specially compounded oil-base coolant is used.

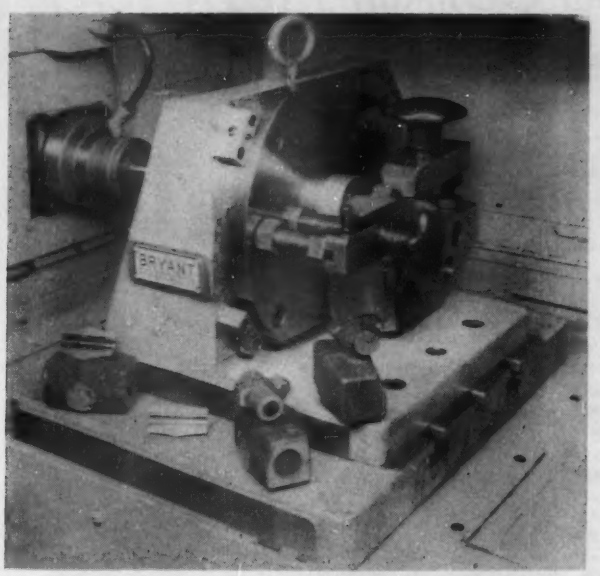


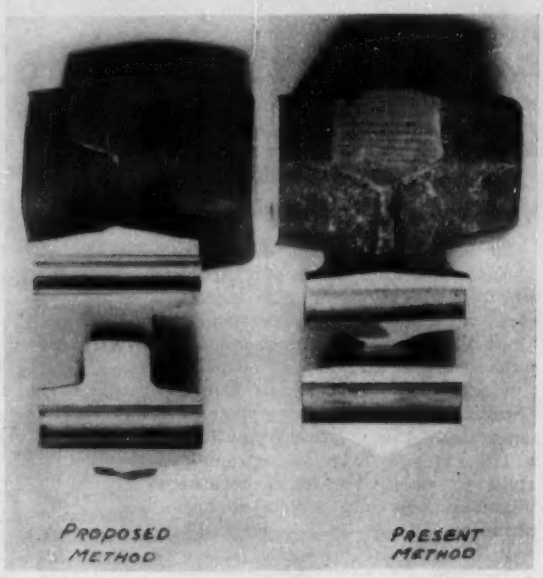
Rotating gun drill cancels secondary operations

Boring machine, using precision gun drills, attains high

Bottomed hole in bearing steel . . . Here a finish-machined pump piston rod of 52100 bar stock (R_c20-25 max) required a hole 0.275 to 0.285 ID by 2-21/32 in. deep, precision-drilled from the solid to 63 mu in. rms or better. With a 2-spindle setup, holding the parts in Jacobs chucks on angle-plate fixtures, parts can be drilled at 106 per hr (100%). Speed is 6200 rpm (450 sfpm), feed 3.1 ipm (0.0005 ipr)







Through hole in steel . . . A governor ballweight, for a tractor, an SAE 1045 forging, is previously machined on locating surfaces only. A hole 0.5010 to 0.5020 in. dia by 1.867 to 1.870 in. long is precision-drilled from the solid through the part. Finish is 25 mu in., rms, or better in contrast with 30 mu in. by the previous method of drilling, reaming, and lapping. The hole is straight and round within 0.0005 in. Production is 36 pc per hr (100%) from a single-spindle setup, using a hand-clamped fixture with a tungsten-carbide guide bushing mounted on a standard angle plate. The hole is bored at 3000 rpm (400 sfpm), and 1½-ipm feed (0.0005 ipr).

accuracies in deep holes

SPRINGFIELD, Vt.—During the last several years, gun drilling has been applied to many formerly difficult drilling jobs. The results: improved production, far better surfaces without subsequent reaming or lapping, and straighter, rounder holes.

Eliminates Finishing Processes

Many examples have been published (AM—July 23 '51, p132; Sept 1 52, p110; May 26 '52, p109; Feb 18 '52, p144; Jan 4 '54, p105). These indicate that straightness, roundness, concentricity and surface finish can be held to close tolerances if desired by adjusting feed and speed—if suitable equipment is available. Further, the slower drilling speed as compared to conventional

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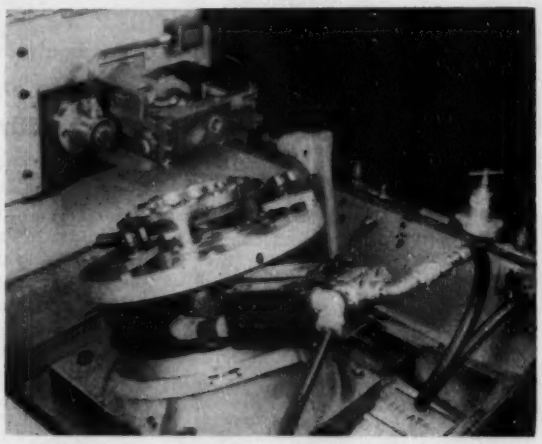
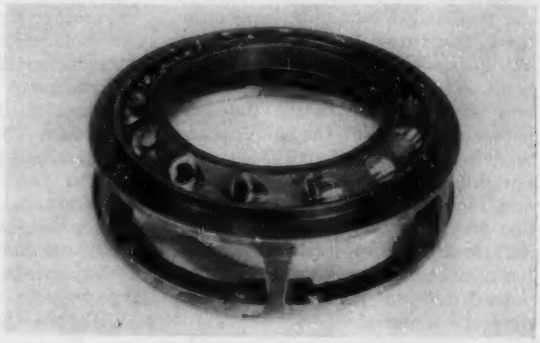




Multiple holes in stainless . . . A cast-stainless nozzle housing required 14 nozzle holes in its periphery. Tolerances were 0.468 to 0.469 dia bore by 1⅝ in. deep. Automatic cycling was provided. The piece was supplied with locating surfaces and drill-entry pads previously machined. Conventional drilling was very difficult and scrap was high. Finish was not important. With an automatic-index, hand-loaded fixture and precision drilling, it has been possible to produce 6 pieces per hr (100%) with hole surfaces of 80 mu in. rms or better. Speed is 4000 rpm (490 sfpm), feed 3.2 ipm (0.0008 ipr). Scrap has been cut 95% and tool cost reduced.

Rotating Gun Drill (cont'd)

drilling is often more than compensated for by avoidance of subsequent finishing process—such as reaming, lapping or grinding.

Years of Experimentation

To provide equipment suited to precision drilling with gun drills, Bryant Chucking Grinder Co began a series of experiments here several years ago. These were supplemented by research at MIT and by cooperative research with some of the men familiar with the art. Developments determined these specific points:

- The machine must be extremely rigid to avoid vibration, because vibration not only affects surface finish and shape—it also markedly reduces drill life.
- Drills have to be much longer than actually required for the hole. Short drills break from chip jamming, don't permit proper "torque wind-up" to overcome momentary hard spots or chip jamming. This is in sharp contrast to conventional drilling, in which the shorter the drill, the better.

Needed: High Coolant Pressures

- Coolant pressures have to be much higher than originally assumed, both to wash out the chips and to provide sufficient volume for adequate cooling.
- Alignment between work and drill must be maintained and feed movement must be positive and constant, or finish suffers and drill life is shortened.
- Drill tolerances have to be very close. Design of drill point is vital.

With these points in mind, equipment was designed to suit the Bryant 998 boring machine to precision drilling, using gun drills. The machine's worktable has parallel bar ways of the pre-loaded ball-slide type, similar to those used sucessfully in Bryant internal grinders. The machine is of extremely heavy construction, and an oversized coolant pump is provided. Some of the applications to date include the four quite-different ones shown on page 162-163—one for an aircraft-engine builder, one for a tractor company, one for an aircraft accessory plant, and one for a machine tool builder. Each involved different hole conditions and different materials.

BLADE TEST. Jet of water, flowing through plastic nozzle, hits test turbine blades at General Motors Technical Center. Blade shapes and settings are changed for maximum efficiency. Possible applications of this research: more efficient auto torque converters, better automatic transmissions

FTC Hits Volume Discounts

Rules against auto parts maker for selling at different prices to competitive customers

WASHINGTON — A Federal Trade Commission examiner has ruled against C E Niehoff & Co, Chicago auto parts maker, for using a schedule of volume discounts that violates the Robinson-Patman Act.

Niehoff, which sells about $2-million worth of brake and ignition parts and test equipment a year, has about 900 jobbers and distributors—some of whom get discounts up to 10-plus-7%, based on their buying volume.

Examiner Frank Hier found that this violates the law—that a manufacturer or distributor can't sell to Customer A at a lower price than Customer B, if they compete with each other. That's illegal price discrimination, unless you can prove (1) that you had to cut prices to one customer to meet a competitor's lower price, or (2) you were able to cut one customer's price because of the savings involved in moving large volume to him.

With the Niehoff decision, Examiner Hier has pointedly given FTC's new commissioners a chance to change the Robinson-Patman interpretations. Mr Hier agreed, in fact, that Niehoff officials had marshalled some "persuasive facts" to indicate that a decision against their pricing system would put Niehoff out of business.

Under the law as it stands, the cards were stacked against Niehoff when its case came up for FTC ruling. For one thing, the Supreme Court in a previous decision said clearly that all that is needed to prove a violation is (1) that price differentials were given to competing customers, (2) that customers can buy from a competitor for a few cents difference per item or pound, and (3) that there is a "reasonable possibility" of injury to competition.

Examiner Hier has said that as far as injury to competition is concerned, he found nothing in the record to show that Niehoff gained competitively by its pricing practices. But, he said, unless a pricing system is temporary, localized, individualized, part of a pricing system, or defensive rather than aggressive, it's illegal—and Niehoff's defense didn't even come close.

EAST-WEST EMBARGO EASES:

What and Where Can Russia Buy Now?

. . . many Western Bloc nations are ready to fill the orders on Russia's $1.1-billion, three-year "shopping list"—now that the East-West embargo list (except to Red China) has been pared. Some machine tools are now okay for export to the Reds, if they're general in character. Our London man reports the facts and figures—and adds some speculation

LONDON (McGraw-Hill World News)—The embargo on shipment of strategic goods to Russia and her satellites is to be relaxed beginning August 16. Red China is excluded from the new agreement. This change is the result of extensive discussion among British, French and US representatives and delegates of 11 other nations.

It is not possible to say exactly what this action will mean to western nations in increased sales to customers Behind the Iron Curtain. But it turns many eyes toward what the USSR would like to get from the West. Russia's Foreign Trade Minister Kabanov spelled out some of Moscow's wants early this year, when he told a group of visiting British businessmen that the USSR would like to buy these for 1955-1957 delivery: $375 million worth of ships, $150 million electric generating equipment, $100 million machine tools and metalworking equipment, $94 million food processing and textile machinery, $29 million of miscellaneous production equipment, $375 million in durables and food.

The British came back to London with an impressive volume of orders. Later, other Britishers went to Moscow and secured further orders. Machine tools and equipment were high on the list of ordered goods.

Many of these orders could not be filled as long as the embargo then in effect was maintained. British machine tool builders, for example, have applied for 1227 export licenses this year for shipments to Russia totaling $80 million. Only 77, with a value of $8 million, have won government approval. The new rules probably will permit shipment of another $14 million. That means that close to three-quarters of the orders are still on the banned list.

Now, after having tightened up sharply when fighting broke out in Korea, the embargo list is being cut from 275 to 170 items. And goods under quantitative control ("you can sell this to Russia, but only in limited quantities") are being cut from 90 to 20. But just to be on the safe side, 60 of the "freed" items are being put on a "watch" list, i.e, sales volume will be checked to make sure shipments don't get excessive.

(Continued on page 166)

RUSSIA'S SHOPPING LIST

What the USSR wants from the West 1955-1957

MACHINE TOOLS AND METALWORKING EQUIPMENT:

1	$50-million, 50,000-ton steel rolling mill
10	planing machines
10	vertical truing and boring lathes
10	gear planers
11	tire-punching presses
15	cold-heading machines
35	stamping presses
12	hydraulic forging machines, 600-3000 tons
50	2-18-ton stamping hammers
10	profile bending machines
15	450-600 wheel and axle-mounting presses
20	plate straightening and bending machines
15	straightening and trimming machines
10	horizontal boring machines
15	hydraulic presses for auto production
50	horizontal forging machines
15	straightening and cutoff machines
8	"Maxi" presses
200	double-action presses up to 250 tons
20	friction-feed presses
27	forging, bending and straightening machines
500	miscellaneous machines tools

SHIPS AND SHIPBUILDING EQUIPMENT:

20	fish carriers
30	8-10,000 dwt cargo ships
15	fishing trawlers and process equipment
1	whaling factory
15	1200-hp salvage tugs
5	large dredgers
5	ocean-going 15-16,000 dwt tankers
20	5000-dwt cargo ships
45	diesel trawlers
30	whalers
2	1500-3000-ton floating drydocks

POWER GENERATING AND TRANSMISSION EQUIPMENT:

110	500, 1000 and 1500-kw power stations
20	5000-kw power trains
50	air circuit breakers
150	20-35-ton steam boilers
150	310-865-kw diesel electric stations
	mobile transformers
	miscellaneous electrical equipment

COMMUNICATIONS EQUIPMENT:

radio measuring instruments	communications gear and instruments

MISCELLANEOUS EQUIPMENT:

furniture veneering presses	bent-furniture-making equipment
textile machinery	food processing equipment
thermo-vacuum chambers	timber motor carriers
control and measuring equipment	special cars, refrigerators, stoves
cable products	gas and steam turbine carriers
railway testing equipment	diesel-powered caterpillar cranes
floating cranes	mining equipment
miscellaneous consumer durables	

(Continued from page 165)

Although the number of embargoed items is loosened, enforcement procedures are being tightened, with trans-shipment control extended to the Continent. Up to now, it has been almost impossible to intercept embargoed shipments to West Europe's free ports—although Britain has excercised this kind of control from the beginning. Britain now makes it a criminal offense for UK merchants to buy banned goods elsewhere for shipment to Eastern Europe and China.

Even though there are a lot of things Russia can buy now that she couldn't buy before, there are still plenty of items she can't get: machines that can only be used to make munitions (gun-boring machines, shell-turning lathes, spar milling machines, etc) are still under a flat embargo. So are heavy presses—but small presses, say up to 100 tons, are being freed.

Some Dual-Purpose Machines

Efforts to free high-speed precision dual-purpose machines have been moderately successful, although negotiations are still in progress over where to draw the line. For example: before Korea, permissible for export in limited quantities were some drilling and boring machines, some milling and shaping machines, some gear-cutting machines and some presses, plate-shearing and sheet-metal-working machines. Highly specialized tools were banned.

As Korea wore on, the embargo was progressively tightened, so that all but one or two of these items disappeared from Britain's exports to the Soviet Bloc.

Now it's a safe bet that many of the categories that were free before Korea will be free again. One of today's knotty problems: just how automatic can an automatic lathe be—and still be on the permissible list? Negotiations on points like this will probably continue as long as the embargo remains in effect.

While there are so far no plans to publish the new embargo lists in detail, general categories will be mentioned in a general way. And it's up to Western exporters and Red buyers to sort out which categories are exportable and which aren't, by noting which applications are approved. Even then, definitions will be continually changing.

Among the facts that have filtered down so far:

- There's no intention of making critical raw materials easier for Russia to buy, but some products will be eased. You can't sell the Reds copper, for instance, but you can sell them wire cable and some other copper products. They're on the "watch" lists.
- The kilowatt capacity of exportable electric power generating equipment is being eased, up to about 10,000 kw, to give the Russians part, but not all, of what they want. This applies to transformers, too.
- Russia won't get the new steel rolling mill it wants. And vertical turning and boring lathes, jig borers, multi-spindle profilers and the like will probably still be banned.
- Farm and small construction tractors will be OK, but heavier crawlers and tired tractors, that could be suitable for military duty, will not.
- Russia can have some of the fishing vessels she wants. She can have diesel-powered arctic trawlers (contract already signed), a few 10,000-ton dry cargo carriers, and used cargo ships, except for ocean-going tankers.
- Odds are that Russia can have as much general consumer goods production equipment as she wants, particularly textile and food processing machinery. Already in the works are contracts for $19.5 million worth of textile machinery, $560,000 worth of flour-milling equipment.
- Largest single category, numerically, on the new banned lists is electronics and communications gear.
- In the "well, maybe—but not too large or too many" list are floating docks, dredges, gas and steam turbine carriers, mobile power plants and the like. Precise specifications will determine whether they're exportable.

Many Exports to Date

With the exception of a few simple general-purpose types, machine tools are about the only goods that have disappeared from the West's post-Korea shipments to Russia. This applies to all the Western Bloc nations. The Low Countries, France, Denmark and Japan have all sold Russia fishing and cargo ships. Norway has exported aluminum, iron ore and ferro alloys. Italy has shipped bearings and small general-purpose machine tools.

Non-Communist countries outside the embargo agreement (Sweden, Finland, Austria, Switzerland, Iran, others) are exporting copper wire, hydro-electric turbines, ship turbines, radio and communications equipment, ships, mining equipment, ores, machine tools, steel plate, miscellaneous machinery and consumer goods.

The eagerness with which the Reds are seeking to expand trade with Britain is emphasized by the fact that Russia, Poland, Czechoslovakia, Hungary, Bulgaria and Rumania all have elaborate purchasing facilities in London. The president of the Russo-British Chamber of Commerce in London is Sir Greville S Maginess, who is also chairman of Churchill Machine Tool Co, Ltd, and head of the Associated British Machine Tool Makers.

The reason for intense British interest in expanding East-West trade is obvious. The Russians are ready to buy nearly $400 million worth of British goods a year as a "starter." In return, Russia is offering to pay either in gold or in goods Britain needs—timber, raw materials and food—for which in many cases she must now pay dollars. For a country that is constantly struggling to keep export earnings greater than import costs, and whose gold-dollar reserves have only recently reached a safe level, such a prospect is mighty tempting.

"Cash on the Line"

And despite all the headaches involved in doing business with Russia, there is one highly redeeming feature—cash on the line.

British industrialists who have gone to Moscow have found that the Russians are little impressed by the "made in the West" sales approach. The Russians tell you exactly what they want—and when they want it. They know exactly what you make, and the lowest price you'll take.

They will buy only machine tools that they don't make themselves, namely, high-speed, fully automatic precision tools. The British have found that Russia is making large numbers of general-purpose tools, such as lathes.

One thing is certain, no matter who Russia favors as a trading partner, she must buy from the West to expand her productive capacity. Russia can't support two Far Eastern wars simultaneously, backstop the industrialization of Red China, and maintain her own economy — not with an economic system that produces armament at the expense of the necessities of life.

Raymond D Lindstrom

Joseph B Clough

Archie F Wilson

Names in the News . . .

Raymond D Lindstrom has been elected vice president, manufacturing, and **Joseph B Clough** vice president, sales, for National Tool Co, Cleveland. Mr Lindstrom joined the firm in 1947 as assistant factory manager, and was appointed manager two years later. He had served in many supervisory capacities at Ford Motor Co before becoming associated with National Tool. Mr Clough, who has been director of sales for the past four years, was previously vice president and part owner of Godfrey Tool & Supply Co, assistant to the president of A W Hecker Co, and vice president of the Johnson & Jennings Co, all of Cleveland.

Paul A Miller has been named manager, manufacturing and engineering, of Ford Motor Co's Parts & Equipment Div, Ypsilanti, Mich. Mr Miller has been associated with the Leece-Neville Co of Cleveland for the past twenty years where he served in various executive capacities. At the time of his resignation August 1, he was vice president, a post he had held since 1951.

Harold Nutt has been named vice president and general manager of Borg-Warner Corp's Borg & Beck Div, Chicago. He has been serving as vice president and assistant general manager. **T L Knecht,** formerly president and general manager, will continue as president. **Richard L Smirl** has been named director of engineering.

Dr Harry Walker has been named vice president in charge of the newly-formed Walker Division of Norma-Hoffman Bearings Corp, Stamford, Conn.

Irving J Minett, who has been administrative assistant to the general manager of the Chrysler Delaware Tank Plant at Newark, Del, has been made operating manager of that plant, and **Hayward F York,** formerly factory manager of the Detroit Tank Plant, Centerline, Mich, has been named operating manager there. Mr Minett, associated with the organization since 1934, was appointed Delaware plant manager in 1950, and later was made general plant superintendent. Mr York, connected with the Plymouth Div for many years, was named plant engineer at the Detroit tank facility in 1952, and later, factory manager.

Jules F Fritts has joined the Mercer-Robinson Co, New York manufacturer of material handling and processing equipment, as executive vice president. He was formerly associated with the Philadelphia Gear Works as works manager.

DAVID W R MORGAN, named president of the American Society of Mechanical Engineers, as announced in AM, July 19, p166. Mr Morgan is a vice president of Westinghouse Electric Corp

Archie F Wilson has been appointed director of manufacturing, Hydraulic Press Mfg Co, Mount Gilead, Ohio. Prior to the appointment Mr Wilson was manager of plant operations at Mather Stock Car Co, Chicago, where he supervised operations of the firm's eight plants.

William L West has been named president of Torit Mfg Co, St Paul, Minn. For the past eight years he has been president of Automatic Control Co, also of St Paul. Mr West succeeds **Edward J Girk,** who is resigning as chief executive to devote his time largely to sales promotional activities. Mr Girk is returning to the office of vice president and sales manager, in which capacity he served for ten years prior to assuming the presidency in 1952.

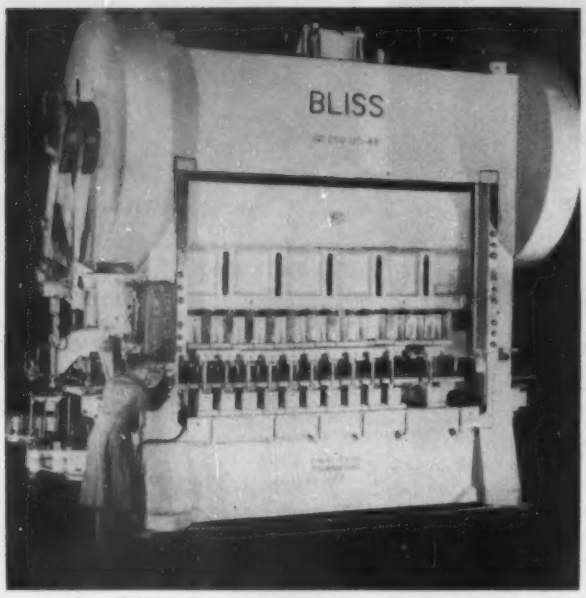
Frazier O Stratton has been named chief engineer of Sterling Engineering Co, subsidiary of American Machine & Foundry Co in Laconia, NH. Prior to joining the firm in 1953 as assistant sales manager, Mr. Stratton was associated for seven years with C P Clare Co, Chicago.

OBITUARIES

Arthur H Ingle, who retired in 1952 as president of the Consolidated Machine Tool Corporation, Rochester, NY, died July 1 at the age of 77. He was one of the founders of the company, was president for many years, and at the time of his death was a member of the board of directors of the Farrel-Birmingham Co, Inc, Ansonia, Conn, of which Consolidated is now a wholly-owned subsidiary.

George T Trundle, Jr, founder and chairman of the board of the Trundle Engineering Co, Cleveland, died suddenly on July 16.

New Shop Equipment,



AUTOMATIC FEED MECHANISM has picked up one load of blanks from six-station turret below. Plunger with rubber vacuum cup picks up blank. If two blanks should stick together, they lift a feeler which acts to open trap door, allows blanks to fall through and press to continue without interruption

Bliss Builds New Transfer Feed Press

A new design of transfer feed press developed by the E W Bliss Company was installed in the Ypsilanti, Michigan plant of the Ford Motor Company. The press features a special stacking and feeding device, an improved slide bar and finger transfer mechanism, and electric controls to guard against any malfunctioning which might be dangerous to the attendant or injure the press and die.

The method of feeding and transferring stock, or blanks, to this machine—the 1000th such press built by Bliss—utilizes two cams and yokes attached to main crankshaft to drive the specially-designed automatic transfer feed mechanism. A plunger with a rubber vacuum cup descends to pick up a pre-cut blank. It rises to deliver the blank to the fingers. If the plunger does not deliver the blank to the fingers, a limit switch stops the press. As supply of blanks is exhausted, limit switch at lower end of plunger stroke is tripped and an elevator pushes a new stack of blanks into the feed position. When the elevator descends it trips a switch that starts a motor and turns a six-station turret to the next full station of blanks. If a new supply of blanks does not come into position, a precision switch stops the press.

Another precision switch in the transfer feed line prevents double blanks from reaching—and possibly ruining—the dies and damaging the press. If two blanks stick together they trip this switch and actuate a solenoid which opens a trap door. Both blanks fall through and the press continues uninterrupted. In addition to safety, this device becomes highly important in maintaining production schedules.

Equally important in the press design is the flexibility of the feed and transfer mechanism to accommodate similar type stampings that require successive or progressive steps or operations. Thus by feeding itself, checking and correcting misfeeds, performing eleven separate press operations, and by delivering up to 28 completed parts for a starter every minute, this press speeds up production and cuts the cost of manufacturing this part, which was formerly die-cast.

Although this 250-ton, 13-station press was designed for automobile production lines, it is not limited to that field.

Built to JIC specifications, it can be used with a wide variety of stampings. It has a centralized control panel which is provided with interlocks to guard against accidents. Only one operator is necessary to keep blanks in the turret and to check on press operation.

The press is of straight-side double-crank design, with a 120x48-in. bed, single-geared with twin drive. The gears are totally enclosed and immersed in an oil bath. Speed can be varied from 14 to 28 stampings per minute by means of a 50-hp adjustable motor. Cam-actuated knockouts in the individual slides accommodate various shell heights. The high-speed single-disk air clutch automatically compensates for wear and allows easy replacement of the linings.

E W Bliss Co, Canton, Ohio

Materials and Parts . . .

Special Testing Machine Simulates Gear Fatigue

Simulated service fatigue tests of gears under loads and at speeds encountered in normal operation are provided in special testing machine developed and built by Sonntag Scientific Corp, in co-operation with International Harvester Co. Machine also permits evaluation of gear lubricants with temperatures between 70 and 350 F. Test gears can be subjected to torques up to 30,000 in-lb with maximum tooth load of 14,400 lb. Pinion speed can be varied between 750 and 2500 rpm to transmit a maximum of 1200 hp. Gears up to 10-in.-pitch dia can be tested. Loading-gear face width of 4⅛-in. maximum governs face width of test gears.

Principle of operation is a closed power system in which two gearboxes are connected by two torque shafts and one gearbox loads the other. Only enough input power is required to overcome friction losses. Machine is driven by 15-hp. adjustable-speed electric motor. Test gear and pinion are contained in gearbox rigidly fastened to frame of machine. Box containing drive gear and pinion serves as lever pivoting on drive shaft so downward force on one end of lever tends to raise load gear on other end. Lever action is free from restriction of rigidly fixed test gearbox by two universal joints and shaft that couples load gear and test gear. Lever action applies load on all meshing gear teeth, since loading gear in trying to climb up on loading pinion, is resisted by torque reaction of test gear. Downward force applied by machine on lever is measured by Emery hydraulic capsule connected to precision load indicator. Torque transmitted to test pinion is measured by Baldwin SR-4 torque meter mounted on drive shaft between two pinions.

Speed and torque can be varied while machine is running and while watching control panel instruments which indicate torque tooth load and speed of operation. Other instruments indicate running time, power of main motor, and number of cycles to cut off. Unit is designed to shut off automatically at any slight increase in normal operating load or tooth failure and all components are interlocked for proper sequence of operation.

Sonntag Scientific Corp, Div Baldwin-Lima-Hamilton Corp, Philadelphia 42, Pa

Single-Pass Acme Tap

Tap capable of tapping most Acme threads in single pass uses relatively fine leadscrew at starting end. Threads pull heavier Acme-thread-cutting portion of tap through hole. Unit is available for single or multiple-start Acme threads in diameters from ¾ to 2½ in.

Horspool & Romine Mfg Co, 5850 Marshall St, Oakland 8, Calif

. . . including

Electro-discharge machine, four-station, produces eight radially spaced elliptical holes in jet diffuser case . . . . page 170

Lathe taper attachment permits cuts of 20° included angle and 15-in. length on 12-in. lathe . . . . . page 171

Precision boring machine is cam-operated, built for fine finishing work . . . . . page 172

Injection-molded plastics parts are produced automatically over full range of shapes within capacity of 4-oz machine page 174

Finishing machine oscillates fixtured parts through abrasive media which remains relatively static . . . . . page 176

Automatic drill unit has ten spindle speeds, incorporates synchronizer auxiliary control page 178

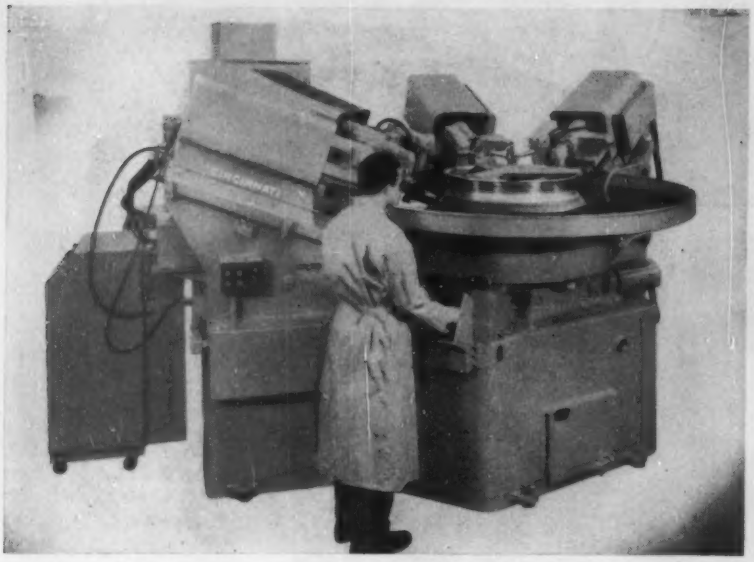
Profiling head permits turning of both internal and external profiles . . . . . page 182

Hardness testing machine performs 400 tests per hour with 10-kg load produced by gravity page 186

. . . and in Aug 30

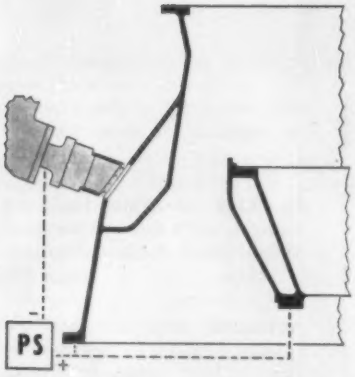
Gear production machine shaves, inspects, and sorts spur or helical gears at high production rates.

Plunge-form grinder operates on completely automatic cycle, provides automatic trueing.

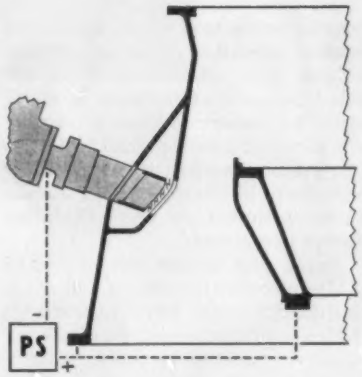


CINCINNATI electro-discharge machine (left) has electrode at each station connected to Elox power pack. Electrode on each slide (stations 1 and 2 shown above) is formed to contour of elliptical hole to be cut, and shaped so its cutting face conforms to the profile of the wall

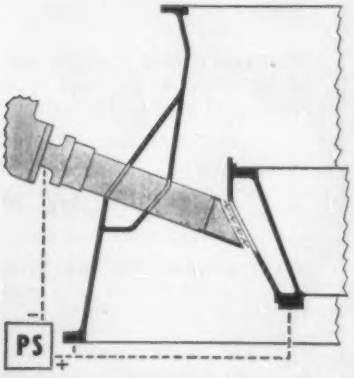
Four-Station Machining By Electrical Discharge



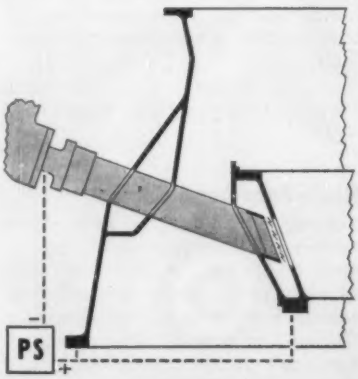
1ST STATION ... Electrode cuts hole through outer wall of larger shell. Workpiece then indexes to next station



2ND STATION ... Electrode passes through first hole, cuts hole through inner wall of larger shell



3RD STATION ... Electrode passes through walls cut at stations 1 and 2 and cuts hole through outer wall of smaller shell



4TH STATION ... Electrode passes through three previously machined holes to cut inner wall of small shell

One difficult operation in the production of jet engines is the machining of 8 radially spaced elliptical holes in the stainless steel diffuser case. The components of the case are an outer shell having a major diameter of about 38-in. and an inner shell having a major diameter of about 22-in.

Due to the double-walled construction of both shells, 4 in-line machining operations are necessary to produce each of the 8 sets of radially spaced elliptical holes—a total of 32 cuts per diffuser case. The contour of the holes must be held to ±0.005-in. and to meet the requirements of subsequent machining and assembly operations, each group of 4 holes must be in line within 0.001 in. The axial angle of the cuts in relation to the vertical centerline of the housing must be held to ±5 minutes.

The cases are being machined within these limits, and all 32 holes cut in a floor-to-floor time of 110 minutes by the special 4-Station Cincinnati electro-discharge machine shown at the left.

The application of electrical discharge machining to this job is illustrated by the schematic drawings. Instead of conventional cutting tools, four servo-controlled slides of the machine each carry a tubular brass electrode. To permit rapid advance and retraction of these electrodes, the slides are mounted on air-actuated rams.

The electrode on each slide is formed to the contour of the ellipse, and shaped so that its cutting face conforms to the profile of the wall to be cut at that particular station. Each electrode, or cathode, is connected to an Elox Power Pack that supplies safe, low amperage and low voltage current. The work serves as the anode. A non-conductive fluid is pumped into the tank surrounding the work. When the electrodes are advanced to cutting positions, they are also covered by this dielectric fluid.

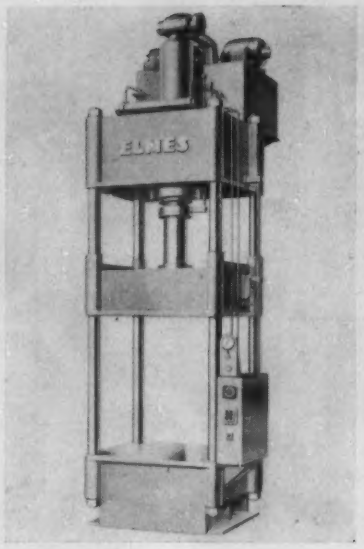
When the power is turned on, thousands of electro-discharges occur each second, and at each discharge a small amount of metal is removed in the area closest to electrode and work. As the metal is removed, the gap between the electrode and work increases. To maintain the predetermined gap size, the sensitive servo mechanism moves the slide, feeding the electrode into the work. The voltage across the gap is used as a reference to control the rate of servo feed. After the electrode passes through the opposite wall, it continues to feed, sizing the hole, until stopped by a limit switch. The limit switch causes the ram to rapid retract and the slide to return to starting position.

Hollow electrodes are used, so that a core results from the passage of the electrode through the work. To prevent these cores from falling to the bottom of the tank which surrounds the work, a permanent magnet is mounted inside the electrode. When the electrode is withdrawn from the work after the cut is finished, the core clings to the magnet and is also withdrawn.

Because of the cutting face of the electrode must conform to the profile of the wall it cuts, only one wall can be cut at each station. This means that the electrodes at the second, third and fourth stations must pass through one, two or three walls respectively, before beginning their cut. For the same reason, simultaneous cutting by all four electrodes does not occur until the fourth operation.

The high degree of precision necessary for these in-line operations at separate stations is made possible by the accurately located slides and rams, and by the electrically operated index base. The indexing accuracy of this 30-in. base, ±0.0005-in., more than meets the requirements for the spacing of the holes around the circumference of the diffuser case.

The Cincinnati Milling Machine Co, Cincinnati 9, Ohio



Hydraulic Press Built For Plastics Molding

Press shown is typical of Elmes line of hydraulic presses built for fiber glass molding—made in standard capacities from 50 to 300 tons. Particular press above has main ram capacity of 100 tons, stripping capacity 30 tons, operating pressure 2460 psi, 36-in. stroke, and it accommodates dies to 48 in. from left to right and 36 in. from front to back.

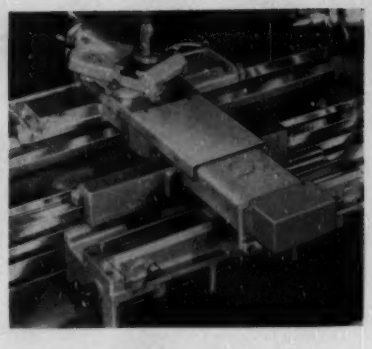
Operation of press is pushbutton controlled. Press advances at 400 ipm and upon reaching predetermined position automatically slows to desired pressing speed. Pressing speed is adjustable downward from 16 in. to practically 0 ipm.

Adjustable timer is provided which can be preset for any length of cure cycle desired. When cure time has run out press will automatically open at predetermined breakway speed adjustable to almost zero. After it is moved away from work predetermined distance, press returns to up-stop position at rate of 400 ipm.

Up-stop position can be adjusted by changing position of limit switch.

The hydraulic circuit incorporates a variable displacement two-way radial piston pump with three position electric remote control and fitted with low-pressure gear pump. Since flow of oil is reversed in the pump, no external control valves are necessary. Additional specifications are: stripping at 30 tons, 64 ipm; ram diameter 10x8⅝ in.; and opening, bed to platen, without spacer 84 in., with spacer 60 in.

American Steel Foundries, Elmes Engineering Div, 1150-A Tennessee Ave, Cincinnati 29, Ohio



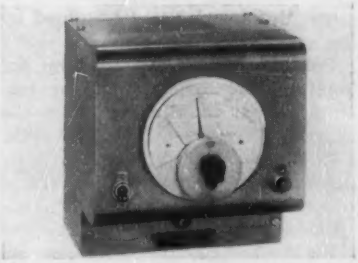
Pratt & Whitney Lathe Taper Attachment

Improved lathe taper attachment is being marketed for use on Model C precision toolroom lathes of Pratt & Whitney. Attachment permits taper cuts of 20° included angle (4-in. taper per foot) and 15 in. in length on the 12-in. lathe, or 18 in. in length on the 16-in. lathe.

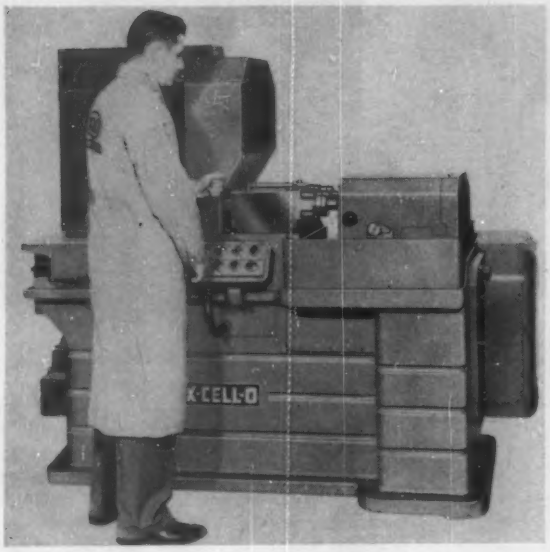
Preloaded balls riding on hardened and ground bearing surfaces eliminate longitudinal play while two of the four bearings in the taper bar shoe are mounted on eccentric studs to allow adjustment and prevent transverse play. Taper bar is bolted to lathe bed by four T-bolts.

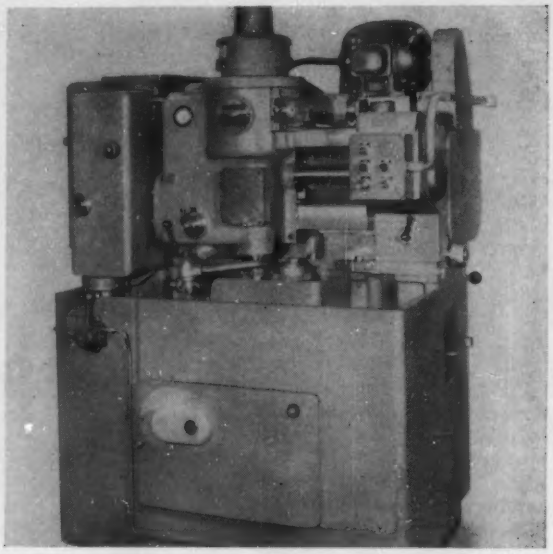
Another feature of the attachment is that a straight cut can be interspaced between taper cuts without changing the taper bar setting. All bearing surfaces, including taper bar ways and cross-feed screw, are hardened and ground. Attachment is protected with wipers and guards to prevent entrance of dirt.

Pratt & Whitney, Div Niles-Bement-Pond Co, West Hartford 1, Conn



CYBER-TAC Model No. 505 electronic instrument controls high temperature furnaces and other heating applications. Using a thermocouple pyrometer in input circuit and power relay in output circuit, Cyber-Tac may be used not only for controlling temperatures, but also to indicate and limit temperatures. It has a thermocouple break protection. The price of this particular model is $95 — *Cybertronic Corporation of America, Dept AM, Industrial Center, 3rd and Morton Aves, Chester, Pa*





Precision Boring Machine Is Cam-Operated

Ex-Cell-O has added style 312 to their line of precision boring machines. Machine is cam-operated and built for precision finishing work such as contouring, boring, turning, facing, and grooving. Cam followers impart rise and fall of cams directly to machine table and cross slide—there are no levers.

Style 312 is designed to accommodate parts that can be rotated on one or more spindles while the non-rotating tools are supported on cross slide. Machine is reported ideal for production contouring work in which forms must be reproduced over and over again within close tolerances. Such forms can be inspected by checking only one dimension because accuracy and relationship of other dimensions are determined by the cams.

Contour form is obtained by the longitudinal movement of the machine table coordinated with the lateral movement of the cross slide. Table carries the spindles with their drive equipment, is operated in rapid traverse by pneumatic cylinder cushioned by oil. Feed portion of table stroke is actuated by cam opposed by air cylinder. All cross slide movements are produced by cam opposed by air cylinder.

Cams are hardened and ground, and are engaged by felt oil wicks to maintain film of lubricant. Followers are tipped with tungsten carbide. Whole cam assembly is hinged so it can be swung out of compartment for changing cams. Both machine table and cross slide are supported on flame-hardened ways. Ways are widely spaced and fitted with gibs for maximum stability. Power lubricating system automatically delivers oil to the ways during each work cycle.

Between the table and the cross slide is a large sloping chip chute that is cast integral with the base. There are no obstructions in the chute, no openings whereby chips or coolant can enter the base.

Ex-Cell-O Corp, Detroit 32, Mich

Blake Pedestal for Tap Chamfer Grinder

The Blake tap chamfer grinder has a redesigned pedestal of modern cabinet style with two doors at the front and an interior shelf for storage of the chamfer grinders and accessories. Steel construction minimizes vibration and cabinet sits on floor, although it can be lag-screwed into place if desired. Top is recessed slightly at both ends to provide pocket so taps will not roll off. Door handle is equipped with lock.

Edward Blake Co, 435 Cherry St, West Newton, Mass

Fellows Gear Shaper Uses 4-Inch Cutter

Gear shaper No. 4GS has a capacity of 6-in. pitch dia, and 2-in. face width for external and internal spur and helical gears. The maximum diametral pitch is 5/7 for spur gears, and 6 for helicals.

Machine uses 4-in. pitch-dia cutter mounted on 3⅜-in.-dia cutter-spindle reciprocated through a 2½-in. rock-shaft driven from a crankshaft. Drive to crankshaft from main drive shaft is through pair of pickoff gears which can be changed to cutter-spindle speeds ranging from 98 to 635 spm. Main drive shaft is driven by 1½-hp, 1200-rpm motor through a Gilmer belt.

Rotary feed of cutter and work is also governed by pick-off gears providing feeds ranging from 0.008 in. to 0.024 in. per stroke of a 4-in. pitch-dia cutter. Relation between number of teeth in work and number of teeth in cutter is maintained by compound change gears.

Other features of the machine are an improved depth-feed mechanism and air-operated saddle return, a cam-trip mechanism to automatically accelerate the withdrawal of the cutter from the work when the last tooth has been cut.

Incorporated in the machine are the following: separate coolant pump and motor operated by switch button, forced feed lubrication for all main operating parts, and a hand operated mechanism for rapid rotation of work-spindle to true work.

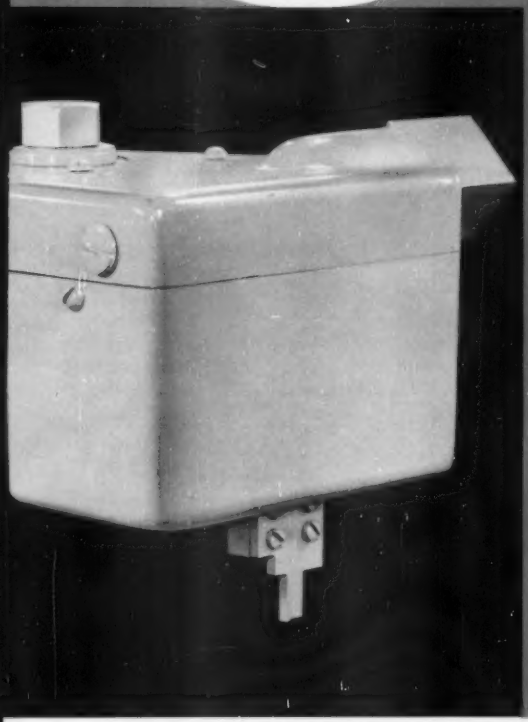
The 4GS is particularly adopted to arrangement for automatic loading and unloading.

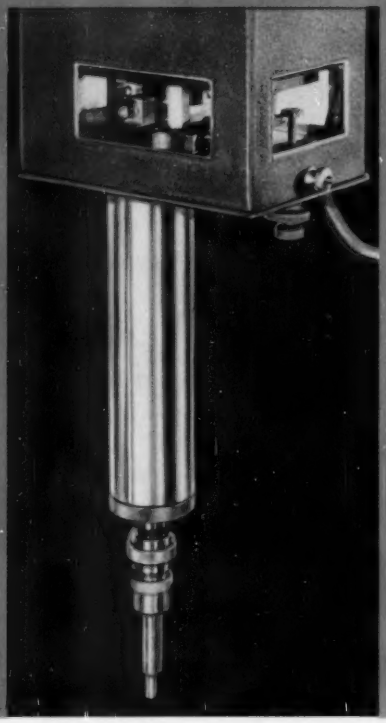
The Fellows Gear Shaper Co, Springfield, Vt

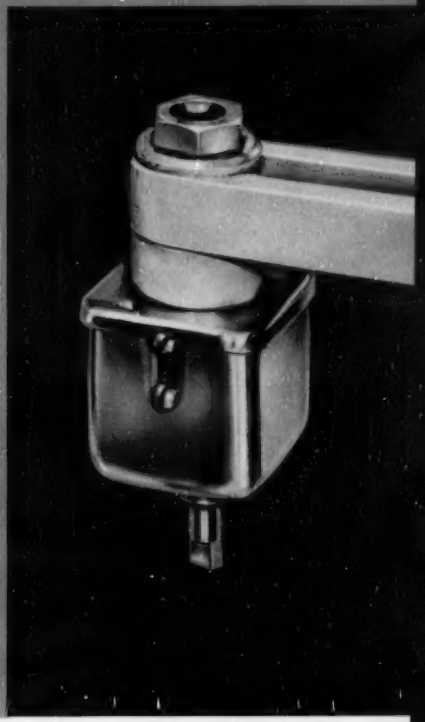
3 Heads are Better Than One

✓ CHECK THE *THREE* TRACER CONTROLLED TURNING METHODS OFFERED BY MONARCH—

PIONEER AND LEADER IN THE TRACER TURNING FIELD







The Motor-Trace . . . for fast, repetitive shaft turning at its economical best—for step boring and step facing.

Monarch-Keller Controls . . . recommended for more intricate shaped molds and dies, for form rolls and other parts.

The Air-Gage Tracer . . . for turning multiple diameter shafts and turning, boring and facing contours.

Why Tracer Controls?

Tracer controlled automatic single-point turning slashes setup time and machining time; cuts tooling costs; reduces tool-crib inventories; in many cases, materially reduces or even eliminates subsequent grinding operations; delivers a high degree of accuracy; by reducing the chance for human error, practically dispenses with work spoilage. In many fewer words, as the job examples on the next three pages prove, it gives you PEAK PRODUCTION AT LOWER COST—for long runs and short ones.

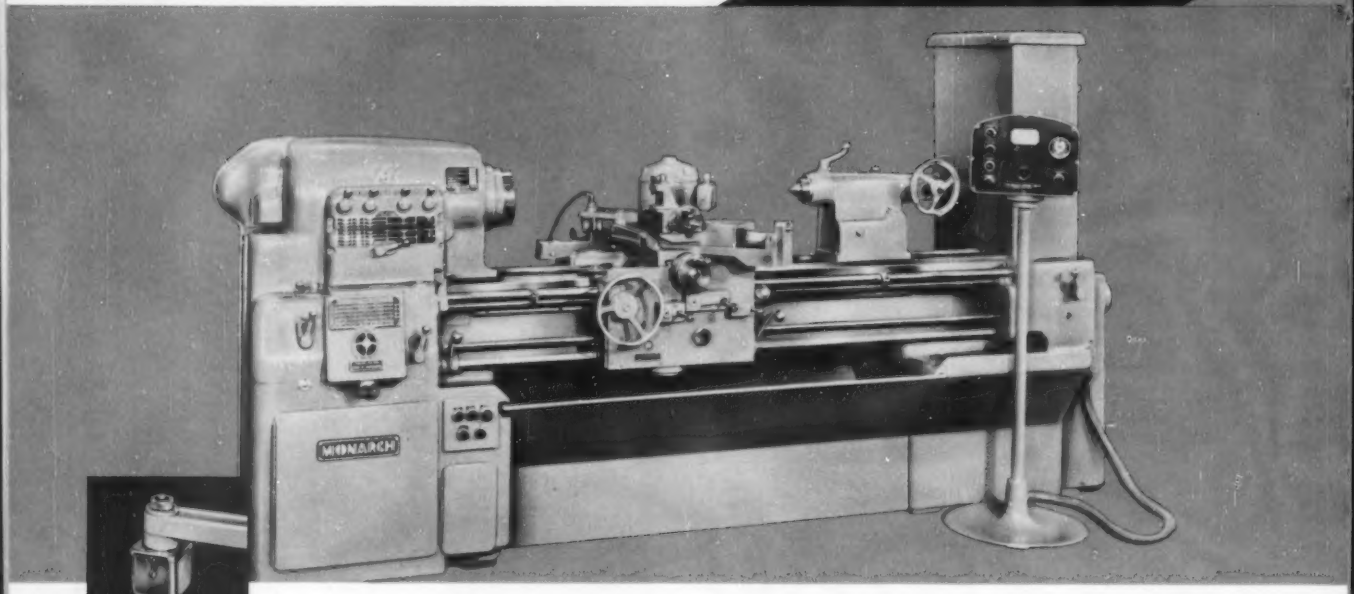
Why Monarch Tracer Controls?

They're our babies! We pioneered Monarch-Keller Controlled Turning 24 years ago—and have been pioneering, proving, producing, refining and innovating ever since. You choose from our 3 types the one suited for your job, and at least one type is available for every Monarch lathe. They use all duplicating methods—round or flat templates, micrometer heads or gage blocks. And they've been used on more lathes, for a greater variety of operations, than any other types of tracer controls. Go Monarch—trace it and save!

IMPROVE QUALITY **CUT COSTS** **BOOST OUTPUT**

(See Examples on Next 3 Pages)

TRACE IT AND SAVE with the Monarch AIR-GAGE TRACER.



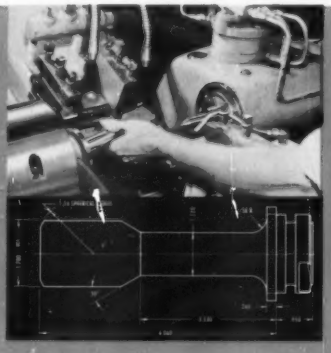
The Monarch Series 61 Lathe with Air-Gage Tracer. Hydraulically operated, controlled on air-gaging principle, this is the most accurate duplicating device on the market. With tracer stylus operating on a pressure of only 5-6 ozs., change in template contour converts to corresponding tool position in thousandths of a second and movement of slide to control point repeats itself within a limit of .0001". It can be applied as factory equipment on all sizes of 10" to 32" machines, the Mona-Matic and Right Angle Lathes—exclusive swiveling type optional. With the Auto Cycle Unit, any Monarch Lathe equipped with Air-Gage Tracer Controls becomes a fully-automatic, high-production unit.

WHAT IT DOES

1. Imparts a smooth, stepless finish because of the continuous, single tool cut.
2. Provides automatic sizing.
3. Eliminates the necessity for repetitive measurements.
4. Generally reduces by half the amount of stock left for grinding.
5. Often eliminates hand polishing or grinding because of the fine finish imparted to the work.
6. Produces more accurate work than any other duplicating device.
7. Eliminates need for expensive forming tools and cost of multiple tool setups.
8. Allows complete setup change in fifteen to twenty minutes; tool change in one minute or less.
9. Permits the machining of practically any combination of diameters, tapers, bevels, forms, grooves, undercuts, shoulders, necks, radii and chamfers in a single continuous cut.
10. Reduces the chance for human error, thereby materially reducing the amount of spoiled work.
11. On many classes of work, saves time and money and provides better finish and accuracy than machining by multiple tool methods.

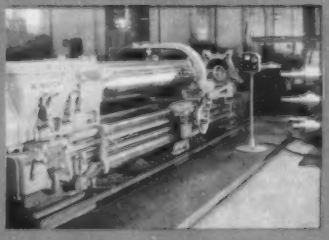
SAVE SETUP TIME

Part—fork 6" x 2" OD. **Material**—4130 chrome-moly forging heat-treated to hardness of 125,000—145,000 psi before machining. **Operation**—finish turn. **Machine**—Monarch Mona-Matic with Air-Gage Tracer. **Comment**—job previously performed on 3 machines—turret lathe, engine lathe and grinder. Total time—50 min. Single Mona-Matic completely turns in 5 min.—*has reduced setup time from 3 hrs. to less than 20 min.* Try *this* on small lots!



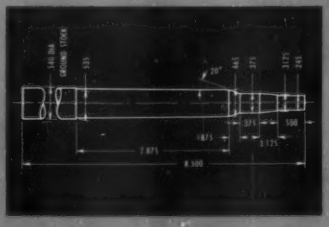
SAVE MACHINING TIME

Part—printing press roll. **Material**—SAE 1045 forging. **Operation**—turn complete. **Limits** — bearing shoulder spacing + .001" and — .000". **Machine**—Monarch 25" x 144" Model N Engine Lathe with Air-Gage Tracer and Auto Cycle Unit. **Comment** — former turning time was 7½ hrs. per piece. Monarch turning time is only 1¾ hrs. per piece. *Five times the production!*

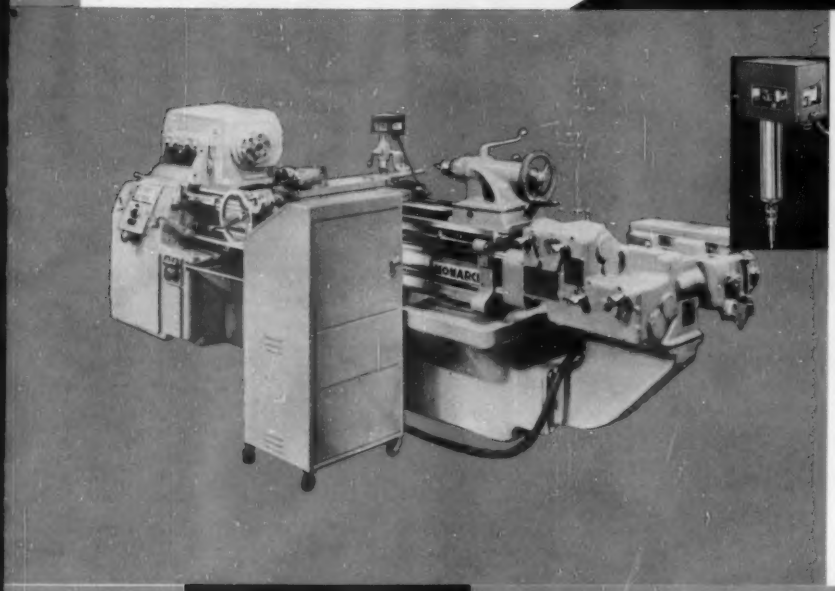


SAVE ALL THE WAY!

Part — reamer blank. **Material** — high speed steel. **Operations Performed**—turn complete excepting .540" diameter. **Maximum Depth of Cut**—7/64". **Limits** — ± .001". **Total Machining Time**—3 minutes 36 seconds. **Machine**—10" Precision Manufacturing Lathe. **Comment**—three cuts are required so as not to spring work. The above production was secured immediately by an operator who had never seen an Air-Gage Tracer equipped machine. *Customer estimates that savings will pay for machine in less than one year.*



TRACE IT AND SAVE with MONARCH-KELLER CONTROLS



Monarch-Keller Form Turning Machines, pioneer of all tracer controlled lathes, have been delivering results for almost 25 years. Magnetic clutch operated, electric tracer controlled through the medium of a push button control stand. Clutch energization occurs in 1/125 second—practically instantaneous response to template contour change, which is reproduced on work to accuracies of ± .001″ or less. Monarch-Keller Controls can be applied to all Monarch Lathes 16″ swing and up—are used on Shapemaster Engraver and Heavy Duty Roll Turners.

WHAT IT DOES

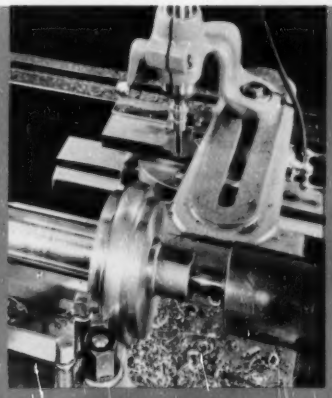
1. With its unique universal stylus movement, very slight pressure creates feed toward, parallel to and away from center line of machine. Substantial savings are thus effected in turning, boring and facing irregular contours, intricately shaped molds and dies, form rolls and other intricately shaped parts.
2. Affords time savings over conventional methods of from 80 to 85% in many cases.
3. Reduces greatly the stock left for grinding.
4. Ease and speed of setup are equally advantageous for both long production runs and small lot work.
5. Affords tooling savings especially pronounced in the elimination of form tools in form roll turning.
6. Duplicating template contours, human error is eliminated and work spoilage greatly reduced. In turning form rolls, there is no need for pairing rolls.
7. Does not limit length or diameter capacity, and has power to take heavy cuts up to the capacity of the lathe used.
8. Controls can be engaged and disengaged at the flick of a switch, making machine available for use under manual control.
9. Electrical control stand can be located to operator's convenience.
10. Controls can be factory-applied to all Monarch Lathes 16″ swing up, or such machines factory-prepared, at slight additional cost, to receive them later in field.

SAVE SETUP TIME

Form Roll for automobile body decorative strips. This job typifies a class of turning that can be handled by Keller controls at savings which cannot be approached by any other method.

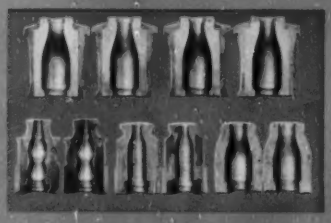
Material is air hardened steel. A carbide cutting tool is used and each roll is both rough and finish turned during the same setup. Maximum depth of cut is 1/32″.

Average turning time for a pair of rolls is slightly over 70 minutes. *Setup time is only 4 minutes per roll,* giving great economy when shifting over from one operation to another.



SAVE MACHINING TIME

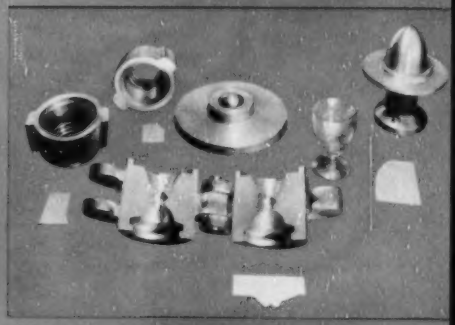
Bottle moulds bored on the Monarch-Keller Lathe. Time required to rough and finish each set of moulds shown here is from 30 to 40 minutes. Usually, on a Monarch-Keller Lathe, the more difficult the nature of the work, the more time is actually saved by doing it with the Monarch-Keller method.



SAVE ALL THE WAY!

Goblet mould set. Photograph shows a goblet mould set made on a 16″ Monarch-Keller Lathe. Total machining time required is 11 hours, 39 minutes. Prior to the use of this machine, 44 hours were required for the same operations.

On this basis of saving, the Monarch-Keller Form Turning Machine would *pay for itself in less than one year.*

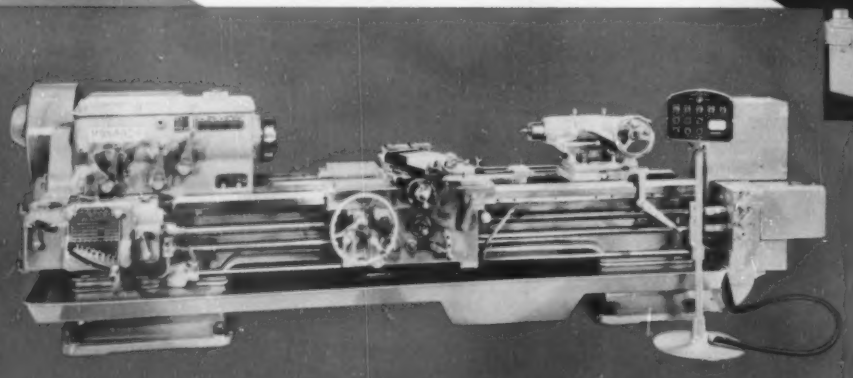


Monarch TURNING MACHINES

FOR A GOOD TURN FASTER • TURN TO MONARCH

FOR MORE COMPLETE MONARCH TRACER CONTROL INFORMATION — SEND COUPON ON NEXT PAGE

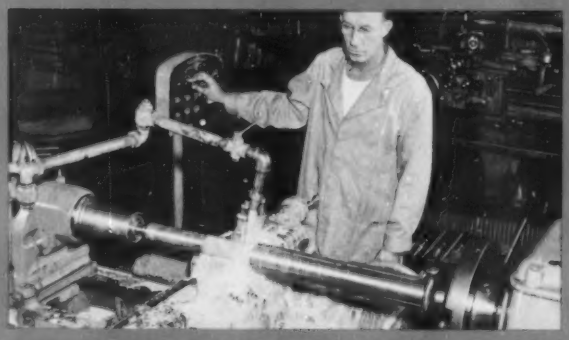
TRACE IT AND SAVE with MONARCH MOTOR-TRACE



Monarch 20" Heavy Duty Lathe with Motor-Trace. Here's fast, repetitive shaft turning at its economical best. With this electric motor operated, electric tracer controlled duplicating attachment, Monarch Engine Lathes become automatic cycle machines producing parts economically in quantities of 2 or 3 pieces and up. That's possible only because of the exclusive micrometer head method of tracer actuation. Applicable to 16" and 20" Monarch Lathes without reduction of normal swing capacity.

WHAT IT DOES

1. Makes it possible to convert a Monarch engine lathe from manual operation to automatic operation in less than one-half minute.
2. Saves time on lots as small as 2 or 3 pieces because total setup never requires more than 15 minutes.
3. On straight, multiple diameter work, provides accurate size control without tracer being in constant contact with a template. This allows use of micrometer heads, gage blocks or a simplified form of flat template.
4. Uses every second of the cycle to full advantage because tool rapid traverses at all times excepting when under actual cut.
5. Permits the pre-selection and automatic use of the correct feed for maximum cutting efficiency on each diameter. As many as five different feeds may be used on the same work piece.
6. Provides complete electric control from the point most convenient to the operator.



Save—with output like this. Part—shaft. Material—AISI 3140. Length—54⅛". Largest Diameter—4.125". Operations performed—turn complete. Number of feeds used on both ends—4. Maximum depth of cut—⅜". Cutting tool—carbide. Limits— ± .002". Total machining time per piece—8½ minutes. Total handling time per piece —3¼ minutes.

TRACE IT AND SAVE WITH MONARCH

Toolmaker's Lathes—10" to 20" • Engine Lathes—10" to 32" • The Mona-Matic *for high production metal turning* • The Speedi-Matic *a fast, precision hand screw machine* • The Monarch Motor-Trace • The Monarch-Keller Turning Machine • The Monarch Air-Gage Tracer • The Monarch Roll Turning Lathes • The Monarch 60" Right Angle Lathe • The Shapemaster Engraver • Special Turning Machines

THE MONARCH MACHINE TOOL COMPANY
SIDNEY, OHIO

See preceding 3 pages for the story
—send the coupon for full information

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Gentlemen: Please send me without obligation the booklet(s) specified below:

___Air-Gage Tracer Booklet #2607.
___Monarch-Keller Booklet #2401.
___Motor-Trace Booklet #2302.
___Please have a Monarch Sales Engineer call with information.

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TURNING MACHINES

FOR A GOOD TURN FASTER • TURN TO MONARCH

FYI

FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 LAYOUT DRILL — *Clereman Machine Tool Co, Green Bay, Wis.* 8-page catalog 625 covers layout drilling machine designed for accuracy to 0.001 in/ft on tools, dies, jigs, and the like. Heavy base, 19-spine spindle, and friction feed clutch that disengages at any point along spindle travel are features. No. 4 Morse taper or Clereman jig-borer collets are available.

2 TURRET DRILL — *Howe & Fant, Inc, 98 Fitch St, E Norwalk, Conn.* 6-page bulletin 5403 introduces a ½-in. capacity drillpress with turret for up to 6 different sequence operations. Turret spindles are set to infinitely variable speeds individually from 200 to 4000 rpm; depth stops are individual.

3 KNUCKLE-JOINT PRESSES—*E W Bliss Co, 1375 Raff Rd S, Canton, O.* 24-page catalog 12-B shows features, construction, and operation of complete line with capacities from 75 to 10,000 tons in 40 standard sizes. Single, double, and nongeared presses are illustrated, Bliss clutches are detailed, and special-purpose presses are described. Accessories such as automatic feeds, standard dovetails, and overhead relief beds are pictured.

4 SS PRESSES—*Dreis & Krump Mfg Co, 7400 S Loomis Blvd, Chicago 36.* 4-page circular SS-54 describes line of Chicago SS presses from 30 to 400 ton capacity, relatively large die area; also shows press brakes.

5 ARBOR PRESSES — HYDRAULIC PRESSES — *Greenerd Arbor Press Co, Nashua, N H.* 12-page bulletin 41 covers hand-operated arbor presses with capacities from ¼ to 20 tons, including standard, armature, and geared types. Bulletin 54 shows hydraulic presses in sizes from 1½ to 75 tons, including a new 15-ton model built to JIC standards.

6 DROP HAMMERS — *Erie Foundry Co, Erie, Penna.* Bulletin 355, with 20 pages and color covers, illustrates and describes steam drop hammers rated at from 1000 to 70,000 pb. Table of standard dimensions, general specifications, drawings and photos, and illustrations of applications are included in the booklet. Detailed information on components and parts is given.

7 HYDRAULIC PRESS — *Stanley H Holmes Co, 3300 W Lake St, Chicago 24.* 12-page specifications manual covers combination hydraulic forcing and straightening press of 5 to 50 ton capacity, strokes from 10 to 30 in., motor input from 2 to 10 hp. Forcing or straightening tables may be attached; motor and pump panel swings out for servicing.

8 BROACHING — *Colonial Broach Co, Box 37, Harper Sta, Detroit 13.* 12-page bulletin C-54 tells how broaching works, compares single and multiple-point tooling, and discusses various machine types.

9 GEAR MACHINES—*Maschinenfabrik Lorenz AG, Ettlingen, Baden, Germany.* 8-page bulletin on Lorenz gear cutters, hobbers, and shapers, gives specifications and illustrations of high-production accurate machines. Separate bulletins on hobbers and shapers show more detail, illustrating various models.

10 GRINDING WHEELS — *Raybestos-Manhattan, Inc, Manhattan Rubber Div, Passaic, N J.* Centerless grinding wheels bonded with rubber are described in bulletin 6925, which shows how roughing and finishing can be done with same wheel. Price list and data on feed wheels included.

11 AUTOMATION DEVICES — *Swarts Tool Products Div, Jefferson Corp, 13330 Foley Ave, Detriot 27.* 8-page brochure "Advancing Automation" describes services and facilities for designing and building workholding fixtures for multi-station and transfer machines.

12 CENTERS—*Whitfield Mfg Co, Washington CH, Ohio.* 4-page bulletin CS-50 covers "Mac" multi-action centers and self-locating revolving stops for screw machines, turret lathes, and grinders. Advantages of 3-point "swirling bearing" and 0.0001-in. concentricity are detailed.

13 VARI-SPEED DRIVES—*Reeves Pulley Co, Columbus, Ind.* 24-page catalog M-543 provides full information on fractional-horsepower vari-speed motordrive, available in four power ratings and ratios from 2:1 to 10:1. Spiral-groove lubrication, operation, control, specifications, and accessories are presented, and 112 different assemblies are shown.

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FYI
FOR YOUR INFORMATION

14 POWER TRANSMITTERS — *Diehl Mfg Co, Somerville, N. J.* 8-page bulletin announces type J fractional- and integral-horsepower transmitters for rapid stop-start action and control of machines. Data sheet shows dimensions, prices, and capacities, and several illustrations are presented.

TOOLS AND ACCESSORIES

15 AIR DRIVERS — *Ingersoll-Rand, 11 Broadway, New York 4.* 20-page booklet, "Production Payoff," is a reference manual on air-powered screw drivers, with a number of applications shown with savings. Also included are advantages of air cushioning, predetermined torque action, specifications on 46 sizes of screw drivers, and accessories for all threaded fasteners.

16 CLAMPS—*Hallwell Tool Co, 606 S Hill St, Los Angeles 14.* 4-page folder covers fast-action C-clamps for jigs and fixtures, claimed to develop 2300 lb force in 8 sec. Tooling clamps built on similar principle are illustrated. Sizes range from 3 to 12 in.; capacities from 1500 to 4000 lb; 8000 lb for tooling clamp.

17 CARBIDE TOOLS—*Newcomer Products, Inc, Latrobe, Penna.* 32-page catalog 100-54 shows complete line of blanks, inserts, tools, boring tools, roller-turner tools, and clamp toolholders. Dimensions, angles, and other specifications are tabulated for all types.

18 MILLING CUTTERS — *Millit Div, Kraus Design, Inc, Flint St, Rochester 8, NY.* 5 data sheets in folder cover attached-blade cutters of increased size span, new carbide slotting saw, and new inserted-blade saw line. Inserts and arbors are covered, too.

19 ELECTRONIC GAGES — *Cleveland Instrument Co, 756 Carnegie Ave, Cleveland 15.* 12-page bulletin 542 describes combination gage head and amplifier, shows how they measure size variations, how they work, and lists extra equipment such as charts, recorders, stands, and the like.

20 FITTINGS CHARTS—*Northwestern Tool & Engrg Co, 117 Hollier Ave, Dayton 8, O.* Conversion charts has catalog numbers for over 100 jig and fixture items like screws, keys, shoulders, knobs, and such. Parts are from seven leading makers.

21 CUTTING TOOLS — *Circular Tool Co, Providence 5, R I.* 32-page catalog N gives complete data on circular metal-cutting saws, including carbide and alloy types; slitting, cutoff, slotting saws, circular knives, center drills, and reamers.

22 SOCKETS—*Apex Machine & Tool Co, 1026 S Patterson Blvd, Dayton 2.* 6-page bulletin 29-A lists extra large impact sockets, extensions, adapters, and Morse taper conversion sockets. Data sheet OP covers precision retaining pins and O-rings for use on the improved socket line.

● TOOLING SERVICE — *Template Reproduction and Engineering Co, 401 N Broad St, Philadelphia 3.* 12-page booklet on "Templatooling" describes tool-design, templet-layout, templet-making, and tool and fixture-making facilities and skills. Request on company letterhead required.

HEAT-TREAT AND WELDING

24 WELDING PLATEN — *Acorn Iron & Supply Co, Delaware Ave & Poplar St, Philadelphia 23.* 4-page flier on bending block, or welding platen, shows uses, sizes, and accessories. Platen is base for work.

25 RECTIFIERS—*Ther Electric & Machine Wks, 10 S Jefferson St, Chicago 6.* 8-page bulletin 5500 depicts plating rectifiers, how to install them, and details facilities of the company.

26 SHIELDED-ARC WELDER — *Lincoln Electric Co, Cleveland 17, O.* 8-page bulletin 1337 covers engine-driven welders for industrial application; including gasoline and diesel drives, dual control and dual continuous control, and with ratings to 400 amps.

27 TRANSFORMER—*Sciaky Bros, Inc, 4915 W 67th St, Chicago 38.* Bulletin 328-10 is a data sheet on the unit welding transformer, kva rating to 70, and weights to 210 lb. Unit is for indirect series welding.

28 INDUCTION HEATER — *Electric Arc, Inc, 168 Jelliff Ave, Newark 4, N J.* 4-page bulletin 5M covers Kilotron high-frequency heater, working at 400 kc, and rated 10 kw or 20 kw, for production-line heating.

PLANT-SERVICE EQUIPMENT

29 LIFT TRUCK—*Yale & Towne Mfg Co, Philadelphia 15, Penna.* 4-page bulletin announces and shows advantages of Safety Silhouette truck, in 1-, 1½-, and 2-ton capacities and featuring 32½-in. width, low cowl, and lowered operator seat.

30 AIR CONDITIONERS — *The Trane Co, LaCrosse, Wis.* Three bulletins cover a cold generator (DS-352), reciprocating compressor (DS-361), and a self-contained air conditioner (DS-362). Cold generators range in size from 10 to 100 tons. The compressor bulletin covers capacities, new Freon 22 models and duplex models, and automatic multi-step controls. Self-contained air conditioners described range in size from 3 to 20 tons; the smaller models with Trane Hermetic compressor.

31 EXHAUST PURIFIER—*Oxy-Catalyst, Inc, Wayne, Penna.* 4-page folder describes OCM catalytic exhausts, shows several sample applications, and depicts advantages of purified exhaust fumes.

32 LIGHTING—*RLM Standards Institute, Suite 518, 326 W Madison St, Chicago 6.* Industrial-lighting specifications book covers upward-component data for indirect lighting where 20-30% of the light goes to the ceiling. Latest RLM revisions in specifications are included.

33 WATER PURIFIER — *Barnstead Still & Sterilizer Co, 152 Kenesville Terrace, Forest Hills, Boston 31.* Bulletin 128 depicts model BD-2 pressure bantam water demineralizer for flows up to 25 gph and pressure to 60 psig. Replacement cartridges are specified.

MISCELLANEOUS

34 HUMAN RELATIONS—*Kelly Read & Co, 808 St Paul St, Rochester 5, N Y.* Checklist for supervision, a small pamphlet, is a test of employee-handling procedure.

35 DAG DISPERSIONS—*Acheson Colloids Co, Port Huron, Mich.* 12-page booklet 460 lists 40 dispersions of metals and other solids in carriers such as water, oil, resins, and alcohol, among others, for application to metal and non-metal products. Methods of application are discussed, and more specific literature is recommended for specific fields.

36 CONCRETE FLOORS — *Kalman Floor Co, 110 E 42nd St, New York 17.* 24-page booklet on granlithic floors depicts specialized flooring for industrial buildings, shows methods of making and finishing, illustrates special equipment, and shows engineering staff.

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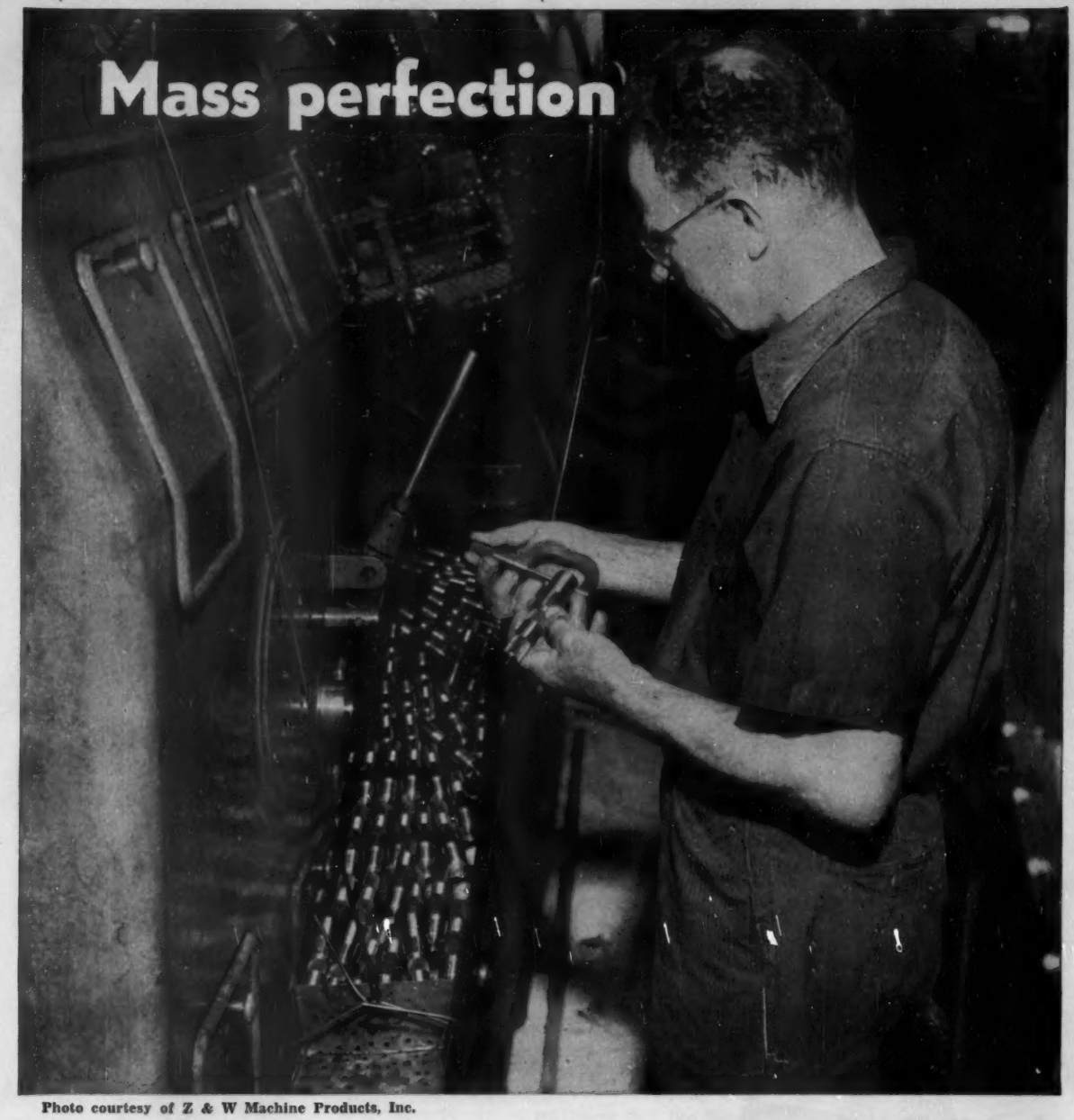

Photo courtesy of Z & W Machine Products, Inc.

Youngstown

QUALITY YOUNGSTOWN SERVICE

COLD FINISHED CARBON AND ALLOY STEEL BARS

●Perfection of products made from Youngstown screw machine cold finished bar stock begins in the open hearth furnace or in the Bessemer converter. There the free machining qualities of the steel are chemically determined. Close inspections throughout processing guard against imperfections. Screw machines working on Youngstown Cold Finished Carbon and Alloy Steel Bars duplicate part after part to exact specifications!

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.

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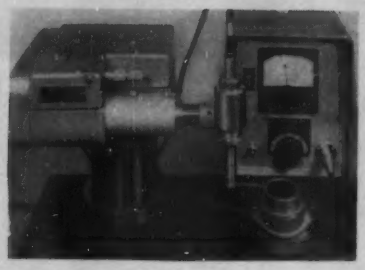
Injection-Molding Machine Provides Automatic Production

Automatic production of injection-molded plastics parts over full range of shapes and sizes within capacity is offered by 4-oz injections-molding machine introduced by Stokes. Machine features positive automatic ejection of finished de-gated pieces. Ejection is positive because pieces and runners are removed from knockout pins by mechanically actuated comb and sprues and runners are automatically detached, leaving finished pieces ready for packing. Operator can handle as many as ten of the new machines since it is only necessary to keep hoppers filled with material and dispose of finished pieces.

This machine, Model 700, incorporates in its design many features drawn from Stokes' automatic compression molding presses. Every strip in the cycle is automatically controlled and the cycle, once established is permanently maintained. All operations are timed to occur in proper sequence. Should any interruption occur, machine will automatically stop until condition is corrected and press restarted. If parts should not eject for any reason a microswitch control prevents mold damage by holding the machine at low pressure level.

Each type and size of part within its capacity can be run by fully automatic procedures. Two or three-plate molds with ejector pins or stripper plate can be handled with equal facility.

F J Stokes Machine Co, Philadelphia, Pennsylvania



Profilometer Pilotor

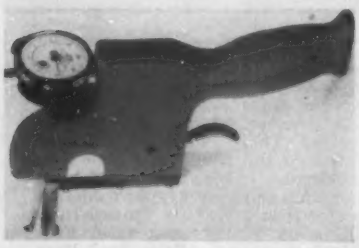
Linear pilot was designed for use with G-type profilometer tracers in measuring roughness of hard-to-catch surfaces. Unit supports tracer and provides vibrationless straight-line tracing movement of any desired length from 1/32 to 1¼ in.

Piloting mechanism is at top of rigid column mounted on 24x18-in. granite base plate. Motor drive assembly gives reciprocating movement to horizontal ram, and ram carries tracer holder which is hinged to permit swinging tracer upward. Tracer holder has collet at bottom for clamping tracer in position, and graduated collar at top for fine vertical adjustment. Length of stroke is adjusted by slidable sleeve and graduated plunger at front of pilotor housing.

Piloting mechanism can be swung horizontally and clamped at any angle to permit tracer to reach over the back end of base plate.

Additional information is in manufacturer's bulletin LT92.

Micrometrical Manufacturing Co, 345 S Main St, Ann Arbor, Mich



Gage Measures ID Of Ring Grooves

Diameters of internal grooves are measured by Model 99P adjustable groove gage. Unit has wide capacity and is adjustable to measure diameters between 0.725 and 2.625 in. Contacts are located at extreme end of gage arms.

Reference or fixed contact is on lower arm so neither weight of gage nor pressure of hand will affect reading. Sensitive movement in which one-to-one lever pivots and ball bearings give dependable repeat readings.

In operation trigger is squeezed to retract upper anvil, and jaws are then inserted into bore. When trigger is released, contacts seat themselves in grooves and slight rocking motion positions contact accurately at the maximum diameter of groove.

Frame is aluminum casting, well-balanced. Comfortable pistol-grip handle makes gage convenient to handle.

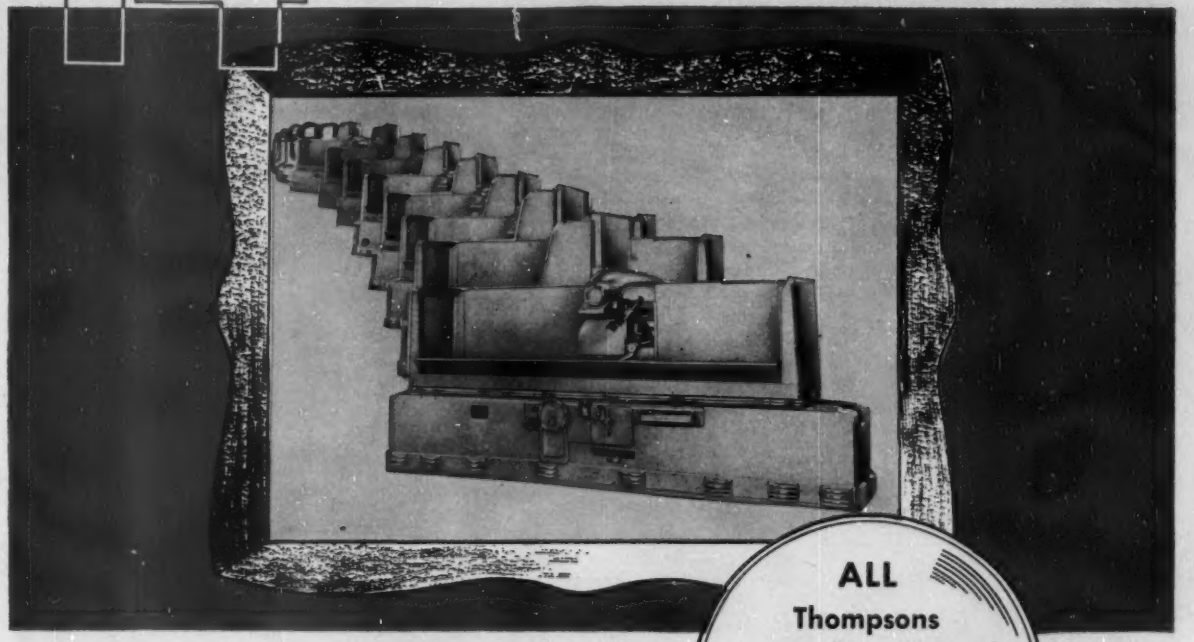
Federal Products Corp, 1144 Eddy St, Providence 1, RI

WELDING TRUCK is reported to make it simple, safe, and easy, to move welding equipment. Pull chain releases utility table for fast set-up. Provides work space 21x26x31 in. Table lock and third-wheel lock can be set without removing gloves. Tanks are nested in shock-absorbing cradle. Entire load moves on balanced three-wheel carriage with nothing for welder to carry — *Nelson Bros & Strom Co, Racine, Wis*

LOOK CLOSELY AT THIS PICTURE
OF GRINDER PRODUCTION AND SEE WHY...

14 *is a lucky number*

for a manufacturer requiring precision grinding



ALL
Thompsons operated continuously with much
LESS DOWNTIME

thats why

it will pay you to invest in

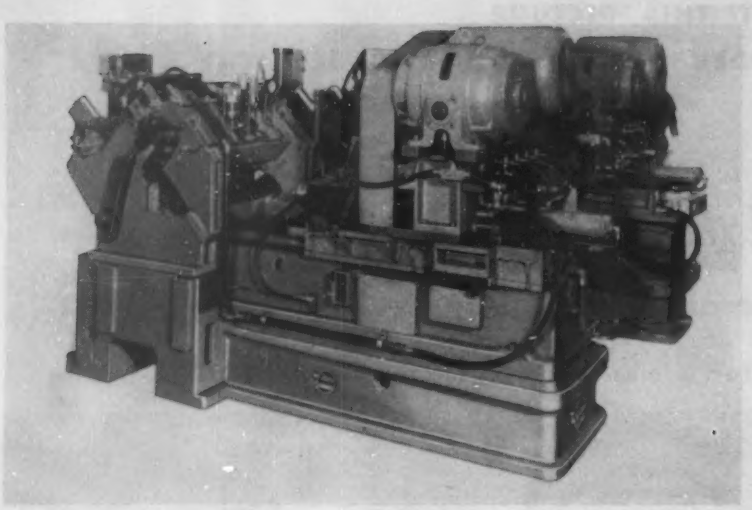
Thompson Grinders

After twelve years continuous manufacture of precision ground products, ten Thompson Surface Grinders proved so efficient and economical that this manufacturer ordered four more machines.

Thompson Grinders are available in a wide range of types and sizes from 6" x 18" to 72" x 384" to meet all production, special or tool room grinding requirements. The Thompson line includes machines from giant Hydrial Way Grinders to automatic Truform Jet Blade Contour Grinders, Dual Rotary Grinders and Broach Grinders.

CONTACT THOMPSON TODAY FOR HELP WITH YOUR MACHINING PROBLEMS

THE THOMPSON GRINDER COMPANY
Springfield, Ohio



PRODUCTION BORING MACHINE works cylinder heads for overhead valve engines. Method utilizes multi-blade tool for forming seats and modified gun drilling tool for boring valve guide holes. Results reportedy show machine has consistenty held concentricity of 0.0005 in. between valve stem hole and valve seat. It is stated that performance tests reveal that special carbide tools employed will produce 15,000 precision valve seats and 2,000 stem holes before tool changes or regrinding is necessary. Gross production on machine is 120 V-8 cylinder heads per hour —*W F and John Barnes Co, Rockford, Ill*

Lincoln Battery Charger Line

Lincoln Electric has announced production of line of battery chargers which it is adding to manufacture of arc welding equipment. This precision-charge line has been introduced with a charger for Edison Industrial truck batteries.

Three models are available to cover charging requirements for batteries of 10 to 42 cells. Machines give constant current charges as recommended by Edison. Correct charging rate for any battery is set with single charging current control. The only other control required for operation of unit is the time control which automatically starts the unit, connects the battery to the charging circuit, and stops the unit when the battery is fully charged.

Batteries are protected during charging cycle as recommended by Industrial Truck Association. In the event of power supply failure, unit is disconnected from power line and charging circuit is opened. Charges are motor generators of compact design and welded steel construction.

The Lincoln Electric Co, Cleveland 17, Ohio

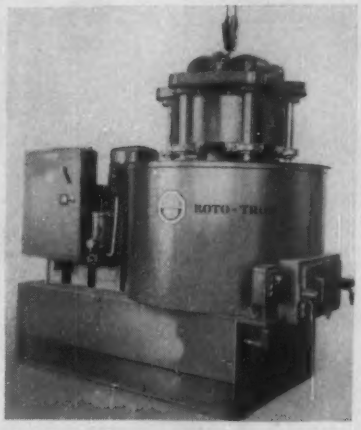
Gear Gage Checks Pitch Diameters

Model 202P inspects pitch diameters of spur, helical gears, and splines. Cylindrical gaging contacts are used and upper one is free to swivel while adjusting it to master. When seated properly it is locked in position. Arrangement provides more stability.

Adjustable rear guide helps locate gage and proper spaces between gear teeth. Pitch diameters of gears having even or uneven number of teeth can be inspected. Thumb lever lifts upper contact so it will clear max dia of gear. Contact is then allowed to settle between teeth. Upper contact is spring loaded to offset weight of gage.

Five sizes are available, each of which has one full inch of adjustment. Among construction features is guard to protect dial indicator against careless handling. Also, gaging contacts are made of tungsten carbide. Both contacts are removable to accommodate gears of different circular pitch. Gage frame is an aluminum casting.

Federal Products Corp, 1144 Eddy St, Providence 1, RI

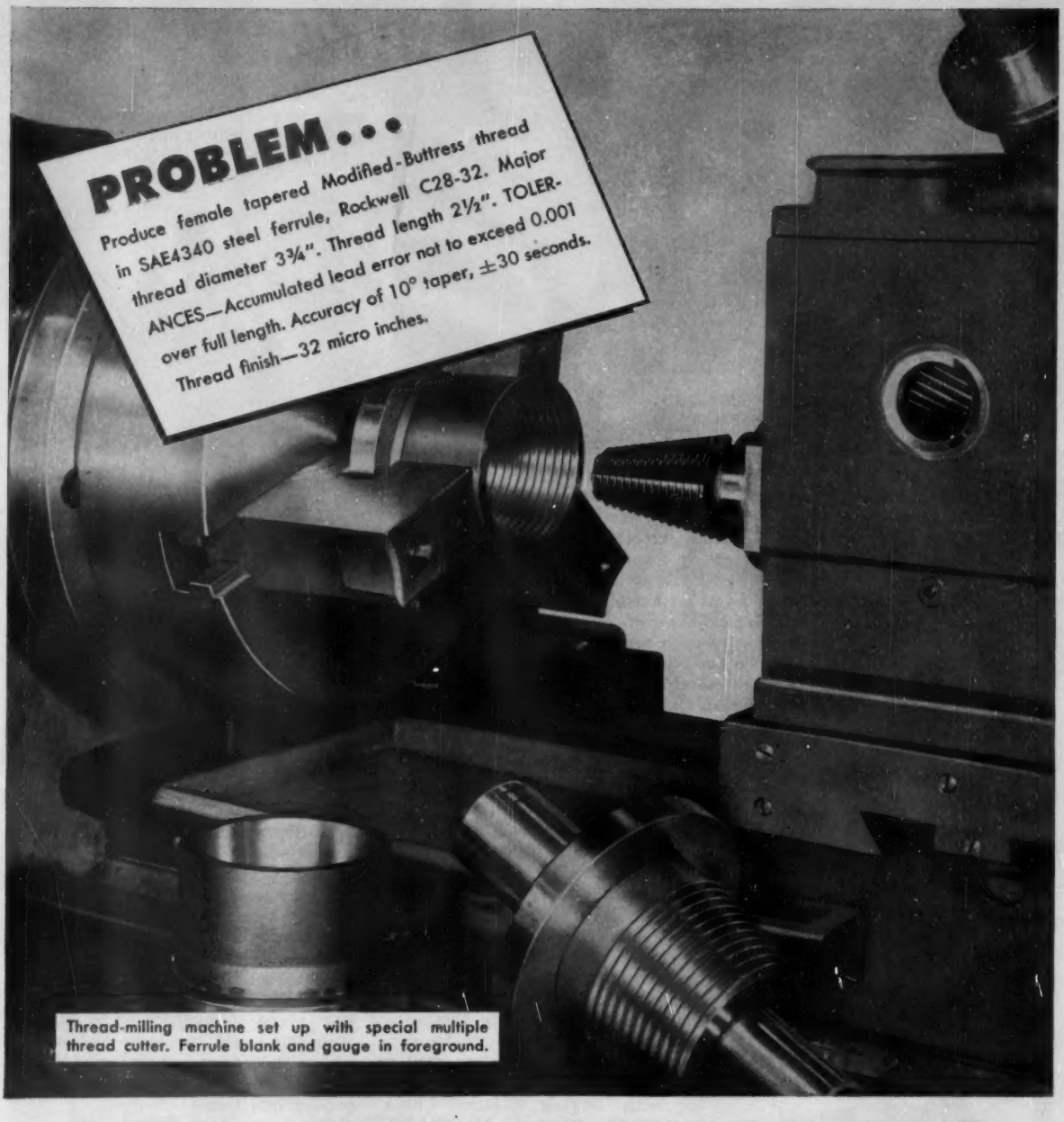


Special Fixture Machines For Metal Finishing

New Roto-Finish machines are reported to be a departure from general conception of tumbling or barrel finishing process. In the Roto-Tron, fixtured parts are oscillated through abrasive media that remains relatively static. Machine is best suited for finishing parts which are too large to be handled by conventional cylinder-type machine. Parts must be rigidly fixtured during the finishing operation. For this reason design of parts must be such that they can adequately resist heavy pressures created by action of forcing fixtured parts through media.

Roto-Tron machine has proven equally effective for dry or wet processing. Principal difference is the tub for holding abrasive media. Tub for wet media has false bottom which allows accumulating refuse to drain away from mass proper. It can be flushed from machine without disturbing main body of abrasive media.

Roto Finish Machinery Co, Kalamazoo, Mich


PROBLEM . . .
Produce female tapered Modified-Buttress thread in SAE4340 steel ferrule, Rockwell C28-32. Major thread diameter 3¾". Thread length 2½". TOLERANCES—Accumulated lead error not to exceed 0.001 over full length. Accuracy of 10° taper, ±30 seconds. Thread finish—32 micro inches.

Thread-milling machine set up with special multiple thread cutter. Ferrule blank and gauge in foreground.

. . . solved by HANSON-WHITNEY Thread Milling

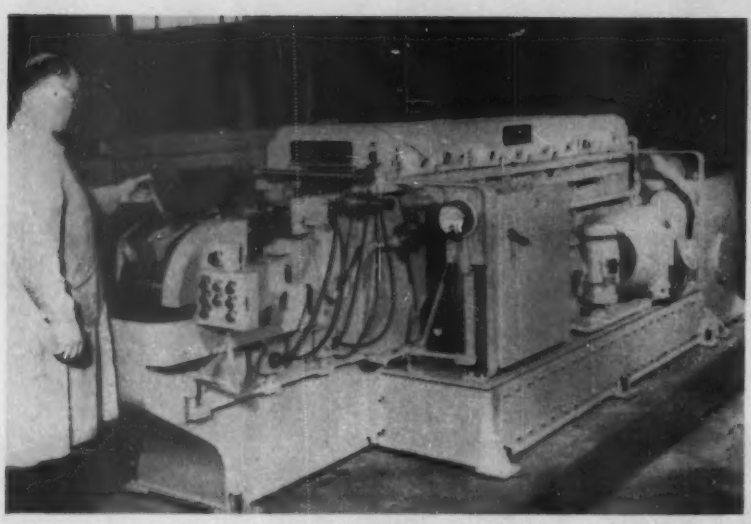
McCauley Industrial Corporation, Dayton, Ohio, manufacturers of aircraft propellers, demand exacting workmanship. Specifications on this blade retention ferrule are unusually rigid for *thread accuracy* and *finish*.

The combination of the Hanson-Whitney Thread Milling Machine and the highly accurate special cutter produced by Hanson-Whitney gave this manufacturer the high quality needed . . . on a production basis . . . and with *no* scrap loss.

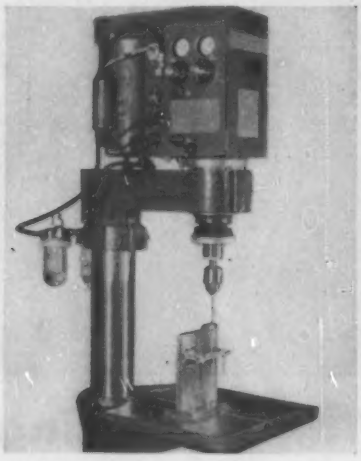
If your threading problems involve *accuracy*—to meet any specification, *production*—to meet any schedule, *uniformity*—to meet any inspection, call your Hanson-Whitney representative for his recommendations.

H *the* **HANSON** Threading Processes offer complete Coordinated Responsibility for The Machine Tools, The Cutting Tools and The Measuring Gauges.

HANSON-WHITNEY COMPANY
Division of Whitney Chain Company, Hartford 2, Connecticut, U.S.A.



CONTINUOUS BROACHING MACHINE has a production rate of 900 parts per hour on the sides, face, and half round of an automotive connecting rod, operating at minimum speed. Part is customary steel forging, amount of stock removed being approximately 1/8 in. per surface. Built with stroke of 120 in., machine is powered by 30-hp. motor. It is built with 12 and 16-in. double roller bearings for drive chain which carries work past stationary broaches. Broach-carrying bridge, hinged on pivots on top of machine swings open for changing broaches. Machine has chip-conveyor attachment for proper removal of chips. Abundance of coolant flows through two coolant pumps. One pump is for broaches at top of machine, the other is used in connection with the chip removal trough. Production rate when broaching at top speed is 1800 connecting rods per hour —*The Lapointe Machine Tool Co, Hudson, Mass*



Self-Contained Automatic Drill Unit

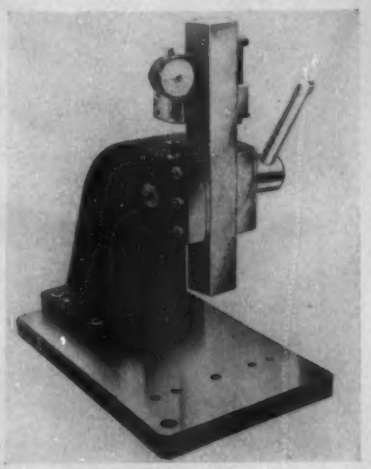
Self-contained automatic drill unit operates on low volume of air—requires only two outside connections, conventional shop air and electric power. A specially designed hydraulic control accessory, an optional feature which controls the rate of feed, is available for drilling hard materials at special angles or on curved surfaces. Because the hydraulic control is separated from the air circuits, repairs at the end of drilling cycles are simple.

This 24 series automatic drill unit is mounted by the nose bracket. Completely eliminating the necessity for relays, switches and valves, units can be mounted in any combination; radial, vertical, opposed, or angular, in standard brackets. The unit measures 8¾ in. in width, 15 in. in height and has an overall length of 23½ in. including the chuck. It has 10 spindle speeds ranging from 440 to 7,400 rpm. Driven by a timing belt which eliminates slippage and decreases friction, unit is available in either ½ or 1/3-hp motor with varying voltages. Chuck capacity ranges from No. 60 drill to ⅜ in.

If it is desired to synchronize the stroke of the unit with indexing fixtures, a synchronizer auxiliary circuit is built into the unit and is part of the standard equipment. In addition to its prime function as a drill unit with conventional chuck attachments, unit can be converted to such operations as tapping, reaming, deburring, centering, counter boring, spot facing, counter sinking, and hollow milling. An exclusive Dumore attachment, an electronic repeat cycle timer is available for deep hole drilling to clear chips and permit coolant to reach drill point in deep holes.

Units can be mounted on standard drill press columns. A trip control for one head in any multiple set-up can be individually cycled for control operations. The unit operates on resistance drilling or control feed.

The Dumore Co, Racine, Wis



Bench Press Handles Precision Assemblies

Micro press was designed for precision assemblies, piercing, broaching, forming, press fits, and burnishing operations that require perfect line up and controlled depth. It is made of fine-grade seasoned cast iron. Bottom of frame and ways for ram are hand scraped. Base is of stress relieved machine steel, precision ground. Ram is of machine steel pack-hardened; ram and gear rack of one piece construction. After machining, teeth are milled, rampack hardened, and then precision ground in line with 0.500 locating hole in end of ram. Pinion is made of machine steel, two-piece construction, with large end of pinion a close running fit in bronze bushing pressed into frame.

Micro stop is made of machine steel, two-piece construction, and chrome plated. One-half of this stop engages in one tooth of gear rack for positive lock, and by means of clamping screw the stop is placed in any position. On one side of stop is fine-thread quick-adjusting screw with lock nut bearing against a hardened stop plug in frame. Another end is a dial indicator graduated in 0.001 in. One-inch adjustment of ram can be had by adjusting screws before having to relocate stop in next tooth.

Queens Tool Engineering and Manufacturing Co, 15 Front St, Rockville Centre, Long Island, NY

The Geargrind Universal Oscillating Grinder will perform a wide range of grinding operations. Its initial cost is much lower than would be expected for a grinder with so many specialized uses.

Now...For toolroom or production work—a really versatile and rugged universal grinder

The Geargrind Universal Oscillating Grinder for Fine Finishing of Spherical–Conical–Cylindrical Surfaces

Whether you need tool room accuracy or production economy, you'll save time and money with the versatile Geargrind Universal Oscillating Grinder.

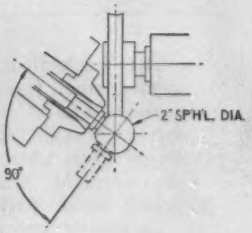
With its various simplified attachments, it is designed to perform *all* of these precision grinding jobs:

- internal and external cylindrical surfaces
- generated or formed spherical internal and external surfaces
- external conical surfaces
- internal tapers
- ball bearing races and fillets

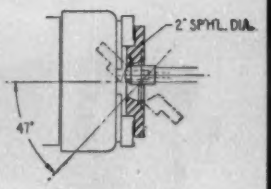
YOU'LL WANT ALL THE FACTS

We have prepared a comprehensive 6-page catalog on all the information and specifications of this unique grinder. Please write—we'll be happy to send it to you, along with a quotation of Geargrind's new low prices.

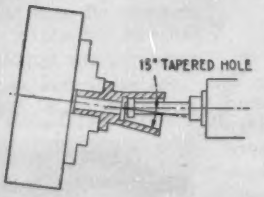
Typical examples of work performed on the Geargrind Universal Precision Grinder



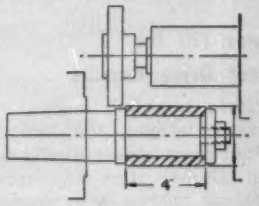
Ball stud, alloy steel, carburized and hardened. Held in a collet.



Flanged ball socket, cast iron. Held in a diaphragm chuck.



Grinding wheel adapter. Grinding the tapered hole. Held in a precision 4-jaw chuck.



External cylindrical grinding.

GEARGRIND Detroit

THE GEAR GRINDING MACHINE CO.
3919 Christopher
Detroit 11, Michigan

AUTOMATIC GRINDER was designed for grinding spherical radius on heaas of automotive valve tappets. Radius is produced according to radius of table with 0.015 in. of metal removal provided by four grinding spindles mounted at right angles to fixture. Tappets are placed into hopper and from there introduced into double track loading mechanism cammed to load two tappets into fixture at a time. The table containing 160 individual fixtures rotates continually at approximately 140 ipm in a clockwise direction. Rotation of table passes tappets across face of rotating grinding wheels with each of four horizontal Blanchard heads removing a portion of the stock. Production is approximately 4,000 pieces per hour and surface finish obtained averages 10 microinches —*Motch and Merryweather Machinery Co, Penton Bldg, Cleveland 13, Ohio*

Power Tilt for Direct Drive Barrels

Uniform tumbling angles, reduced operator fatigue, and 20% savings of floor space are reportedly achieved with Globe's line of direct-drive tumbling barrels with development of power tilting. Tilting mechanism is controlled by reversing drum switch and unit is designed for manual starting with automatic shut-off at adjustable high and low limits.

Power Tilt device is available optionally with Globe's direct-drive barrels at rated capacities to 3000 lb. Shaft speed on tilting unit is 48 rpm providing a limit-to-limit tilt time of 30 sec for ¾ hp unit, and 20 sec for lighter barrels.

Tilt mechanism is mounted on welded steel frame and bolted to barrel pedestal. Gearmotor shaft drives through flexible coupling to worm gear which engages tilting gear segment. Shaft is mounted in bronze bushings with thrust washers.

Automatic control of tilting is achieved by pivot-mounted stop rod suspended from tilting segment. Rod extends through reversing drum control with adjustable limit stops. As mechanism moves barrel up, rod slides down through control to stop, shutting off gear motor. Machine is stopped similarly in downward movement by opposite limit stop.

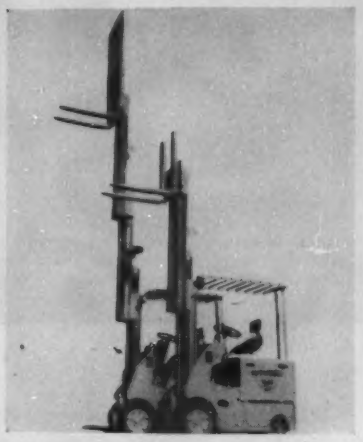
The Globe Stamping Div, Hupp Corp, 1250 West 76th St, Cleveland 2, Ohio

Automatic Pressure Lubricator

Automatic high-pressure-grease or heavy-oil lubricator is designated Hi-Lo. It is constructed of solid cast bronze for adaption to outdoor conditions. Water tight and non-corrosive with positive functioning construction, lubricator is operated through coil spring pressure controlled by a moving piston with metering pin to maintain a uniform flow.

Visual teltale extending rod shows when refilling is required. In operation low pressure lubricant is applied continuously; high pressure periodically. Unit is adaptable to use with various standard lubricating guns.

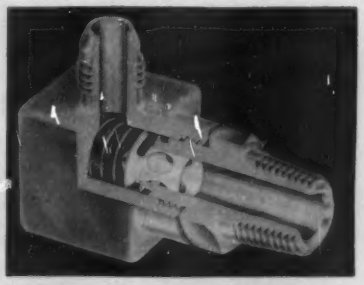
Bronze Bearings Inc, 410 North Ave, Cranford, NJ



Triple Telescopic Mast On Automatic Fork Truck

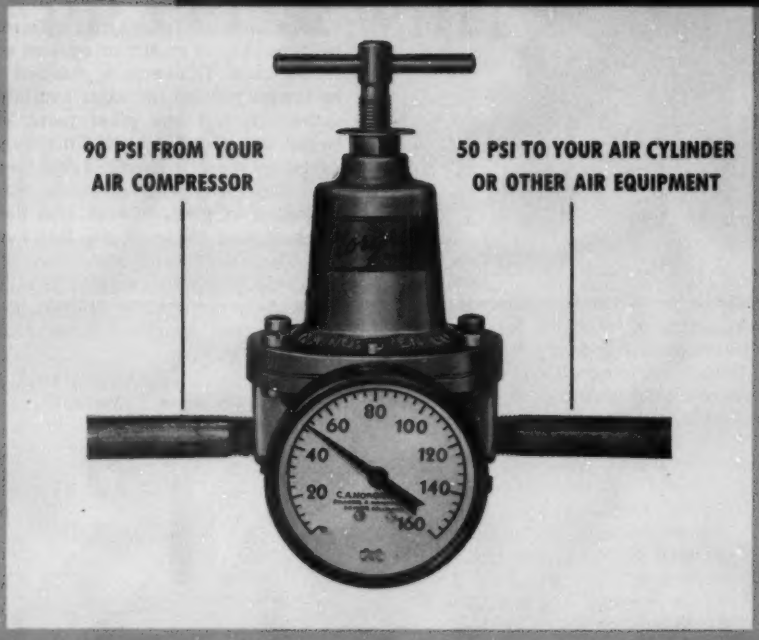
Automatic Transportation has introduced a triple telescopic mast which permits 198-in. tiering by standard 83-in. high fork truck. Construction is achieved by adding second rising section to truck's uprights. Mast is an integral part of Automatic's standard fork truck chassis and is available on trucks with capacities from 2,000 to 10,000 lb.

Automatic Transportation Co, 149 W 87th St, Chicago 20, Ill



RIGHT ANGLE CHECK VALVE has been developed to answer need for valve having all characteristics of standard inline 200 series, but which must fit into limited space. Same chatter-free, zero-leakage design principles as used in other circle seal valves have been applied. Right angle design will simplify line arrangement —*James-Pond-Clark, 2181 E Foothill Blvd, Pasadena 8, California*

Why waste compressed air at 90 psi where 50 psi *will do a better job ?...*



...and

- ***reduce wear on air equipment***
- ***save dollars on air costs***

USE NORGREN PRESSURE REGULATORS

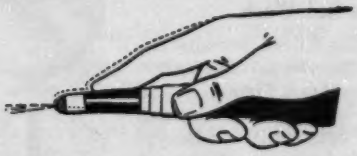
Norgren Regulators more than pay for themselves in savings in air costs alone. More important—they accurately control air pressures to assure proper operation of equipment and minimum maintenance costs. Available in wide range of remote control, low pressure, relieving and cylinder gas types.

WRITE FOR NEW CATALOG No. 600

C. A. Norgren CO.
3436 So. Elati, Englewood, Colo.

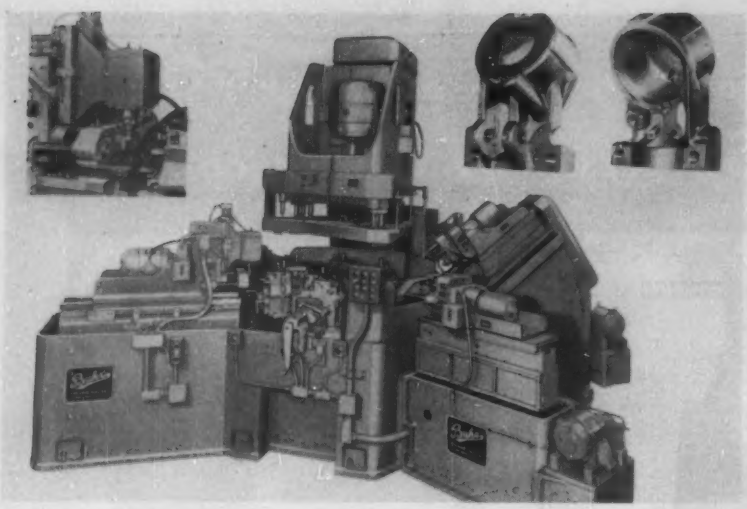
PIONEER AND LEADER IN OIL-FOG LUBRICATION FOR 26 YEARS

ANOTHER IDEA FOR CUTTING AIR COSTS

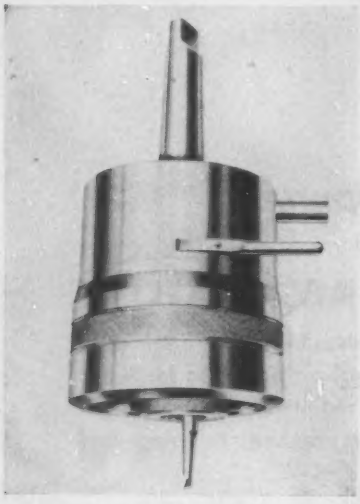


A blow gun with 90 psi line pressure uses 10½ cfm of air. 30 psi usually does the job just as well and uses only 4½ cfm... saving 6 cfm every minute—on one gun used an average of one hour per day the saving would be 90,000 cu. ft. of air per year.

VALVES • FILTERS • REGULATORS • LUBRICATORS • HOSE ASSEMBLIES



SPECIAL MACHINE performs 18 operations on automatic transmission parts with production capacity of 124 pieces an hour. Machine features special milling heads arranged with automatic back-up. Unit is 5-way automatic indexing type with 6-station 2-place fixture. There is an attached tool board to keep tool-changing time to a minimum. Hydraulic and electrical installations are designed to JIC standards —*Buhr Machine Tool Co, Ann Arbor, Mich*



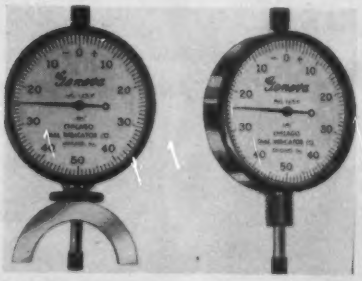
Profiling Head Permits Internal, External Work

Model 30 profiling head permits the turning of both internal and external profiles, provided forms of such profiles allow toolbit to be engaged in continuous cut. Built for heavy-duty operation, body of attachment is drop-forged and all movable parts are case hardened.

Unit can be used in turning square, hexagonal, octagonal, and other polynomial profiles. A templet of the form which is required is inserted in the head—templets are about ¼ in. thick—and one templet permits machining of an unlimited number of pieces. Templets may be made of molded nylon or of mild steel. Complicated profiles are machined by using progressive templets. The form of the templet is transmitted to the workpiece by roller guide. An ordinary boring tool bit may be used for turning profiles, thus eliminating the need for special tools.

The provision of a micrometer scale on the adjusting barrel is said to assure an accuracy of ± 0.0005 in. Device is said to machine profiles with corner radii of less than 0.02 in.

Bansbach Machine Co, 221 N Cicero Ave, Chicago 44, Ill

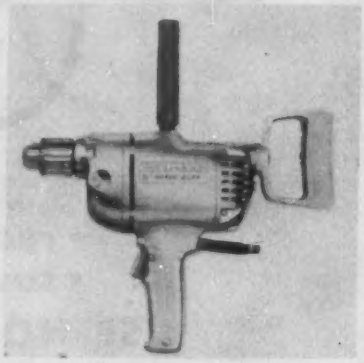


Threaded Stem Indicator Simplifies Setup

In setups, where dial indicator is to be attached to machines permanently, Geneva Dial Indicator with threaded stem eliminates unwieldy clamping and overcomes problem of binding the indicator spindle. Threaded stem indicators fitted with special bases such as U-shaped type are used as depth gages for holes, recesses, and slots. Another special base is used with threaded stem indicator equipped with long tapered points to permit comparison of small holes or narrow recesses in wide openings.

Solid back of Geneva dial indicator reduces chance of dirt or coolant entering case. Indicator is claimed to be lowest friction indicator available —there is but one pivot point between driver and driven. This leverage gives reading by using few teeth in comparison with ordinary compounding of gears. Lever arm does work of gear 1⅞ in. in dia. Balanced and continuous dial indicators are available with threaded stem in graduations of 0.001, 0.0005, and 0.0001 in. and ranges of 0.200, 0.125, and 0.060 in.

Chicago Dial Indicator Co, Dept D, 180 N Wacker Drive, Chicago, Ill



Two Electric Drills Feature High Twisting Power

Model 516 is a ½-in. electric drill claimed to have 45% more twist power than nearest competitor. Weight is 10 lb, length 14¼ in., height 9⅞ in. Motor draws 6 amps and rotates ½-in. gear chuck rated for 1 in. in steel, 1⅜ in. in wood.

Unit has eight ball bearings and double-compound reduction gears, helical gears, aulminum housing, removable commutator cover, and accessible brushes. Accessory vertical stand converts the drill into a drill-press adjustable from 0 to 10 in. high, with 5 13/16-in. feed and 7 1/16-in. radius from column center.

The ¼-in. unit, Model 515, draws 3 amps and has six ball bearings. Weight is 3¾ lb, length 9¾ in., height 6½ in. Pistol grip and push-button lock are included.

Porter-Cable Machine Co, 34 Exchange St, Syracuse 8, NY

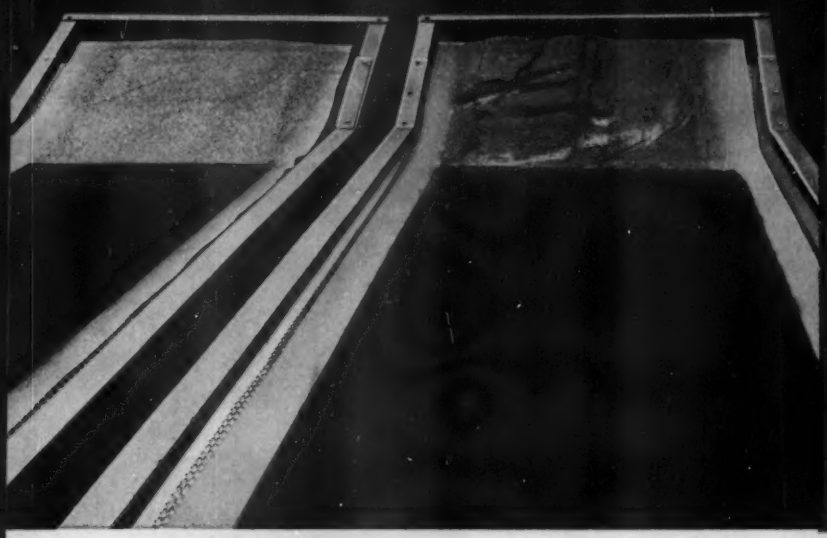
Delpark FILTRATION

AT

PRATT & WHITNEY AIRCRAFT

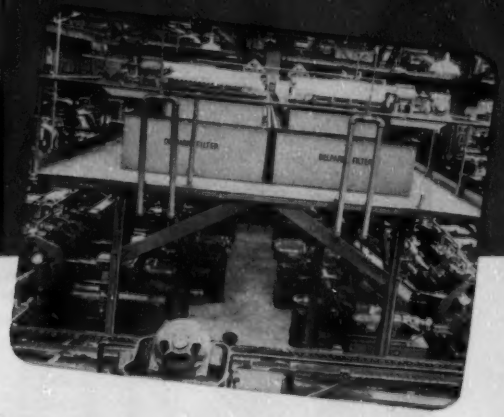
(DIVISION OF UNITED AIRCRAFT CORPORATION)

filters Aluminum Chips from Cutting Oil



Close up of DELPARK units filtering cutting oils from a battery of automatic Footburt Machines.

Illustration below shows same DELPARK installation in its position above the machines being served.



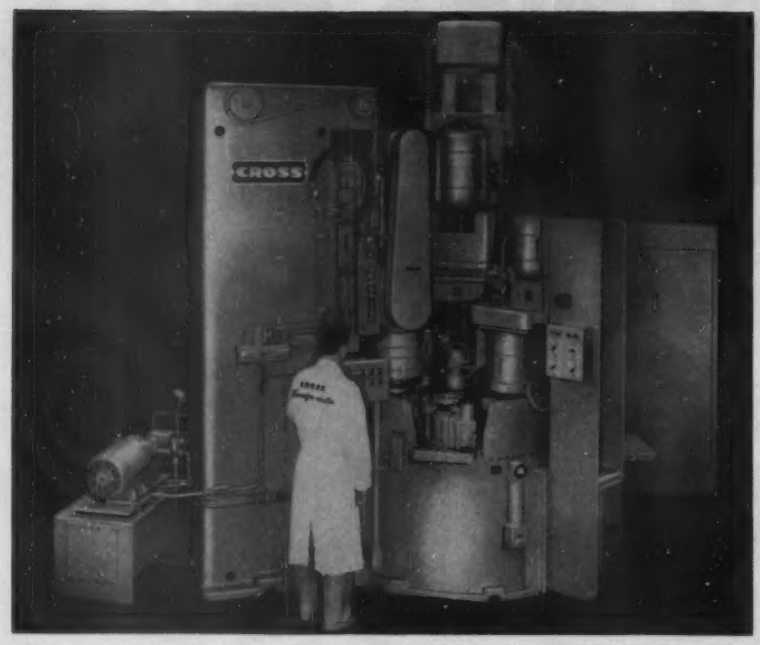
There are thousands of DELPARK Filters in industry today and the reasons for their acceptance are simple. The savings in maintenance labor alone is enormous yet other savings in reduced rejections, extended coolant and tool life and reduced machine parts replacements add up to even greater savings. Here is one part of production where costs can be materially reduced without retooling for design changes. Here, with DELPARK filtration, greater efficiency of men and machines can produce better products at less cost with greater accuracy.

It's a simple operation to let DELPARK filtration lower your operating costs and increase your profits. Let an experienced DELPARK filtration engineer give you the facts on DELPARK filtration. *Write for more complete information.*

Delpark INDUSTRIAL FILTRATION

Backed by More than 30 Years Experience in Industrial Filtration

INDUSTRIAL FILTRATION COMPANY, 115 INDUSTRIAL AVENUE, LEBANON, INDIANA



CROSS SPECIAL MACHINE tool bores, drills, reams, and taps aluminum transmission shaft supports. It turns the rear face, counterbores the large pilot diameter, drills six holes, drills and reams two locating holes, chamfers and taps five holes, and production is 128 castings per hour. Index table has six stations and is fluid-motor driven. Important features includes hydraulic feed and rapid traverse, hardened and ground ways, filtered coolant system, construction to JIC standards, and automatic work cycle —*The Cross Co, Detroit 7, Mich*

Torque Screw Driver

Model SD6 Trutorq may be preset at any torque between zero and 6 in.-lb; accuracy may be held within 8 in.-oz. Once set, the screws may be turned with guaranteed tightness.

Torque mechanism is patented friction clutch which prevents torque beyond preset point from being transmitted to screw driver blade. When desired torque is reached, handle continues to rotate, but position of blade remains fixed.

Model has an aluminum handle, is 3¾ in. long and weighs 5 oz. It is designed to accomodate a standard screw driver blade, hex bits, Phillips bits, a 1¼-in. square drive, or special blades.

Airdraulics Engineering Sales Co, Allendale, NJ

Magnetic-Particle Test Unit

Portaflux weighs 45 lb and was designed to locate surface defects in rough castings, bar stock, forgings, and shop welds. Objects to be checked are magnetized either by passing current directly through metal or through surrounding cable in form of coil. Magnetic ironoxide is distributed over surface of magnetized object and alignment of particles is such that defect is clearly located.

Unit has two heavy-duty, oil-resistant insulated cables with heavy-duty renewable products that carry currents up to 600 amps at maximum voltage of 1.5. Special metal coupler is provided for connecting prods together. Control panel has indicating meter with range of 0 to 600 amps. Three-way selection switch is available for different ranges and pilot lamp indicates when high range is in use.

Unit has novel indicating device which shows direction of flux in magnetized objects and indicates presence or absence of sufficient field strength. Unit measures 18x12x7 in.

Research and Control Instruments Div, North American Phillips Co, Inc, 750 S Fulton Ave, Mount Vernon, NY

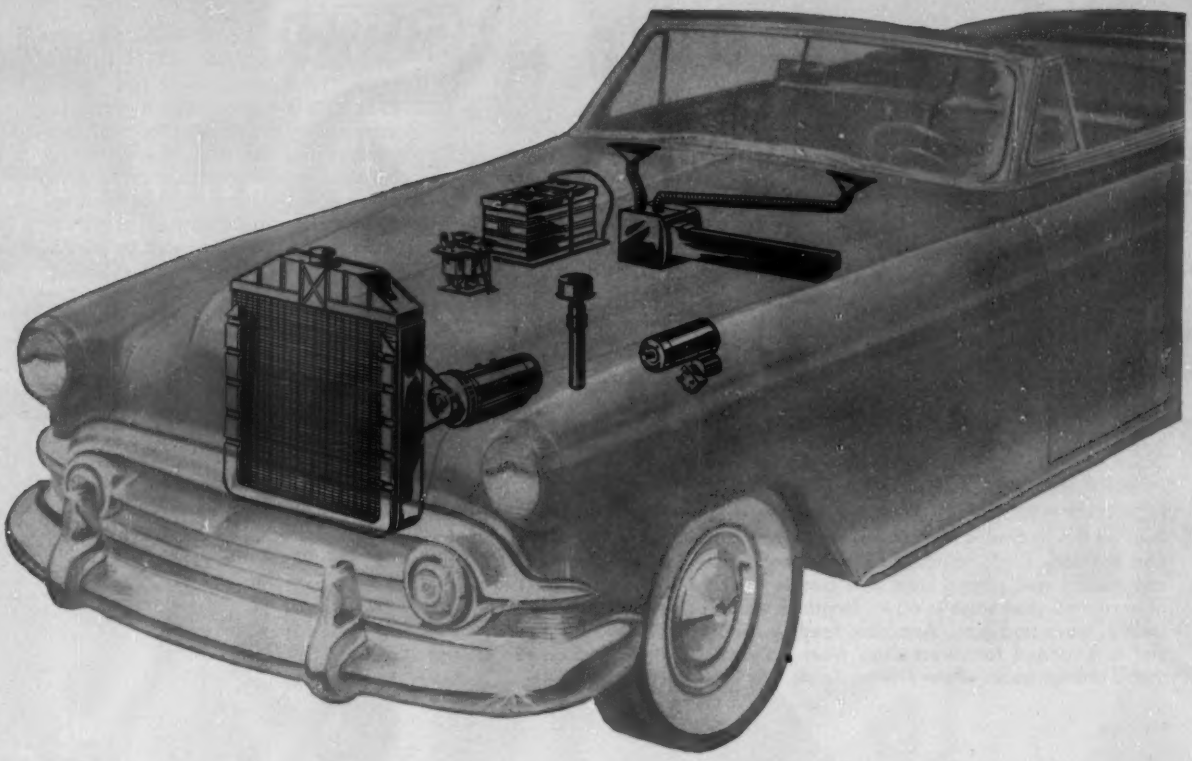
Bench Air Press Offers Stroke Control

Vi-Speed Power House air press assembles, bends, straightens, punches, stamps, trims, rivets, broaches, crimps, and swages. Construction is reported to be rugged and simple and utilizes Vi-Speed air cylinder power units of 50:1 ratio and 1½ and 6-in. stroke, plus adjustable air-stroke-limit control. This provides unlimited pressure adjustment from feather-touch to 2½ tons, hand- or foot-controlled.

Rigidly guided 2-in. ram is non-rotating with ram extensions supplied for easy adjustment; it will handle off-center work.

Work can be entered from four directions.

Van Products Co, 3736 W 18th St, Erie, Pa



from Hydrazine, improved soldering fluxes

A remarkable new series of soldering fluxes has been developed by McCord Corporation, one of the largest builders of automotive radiators, refrigeration and air conditioning surfaces, that makes possible greater economy and efficiency in production of soldered components.

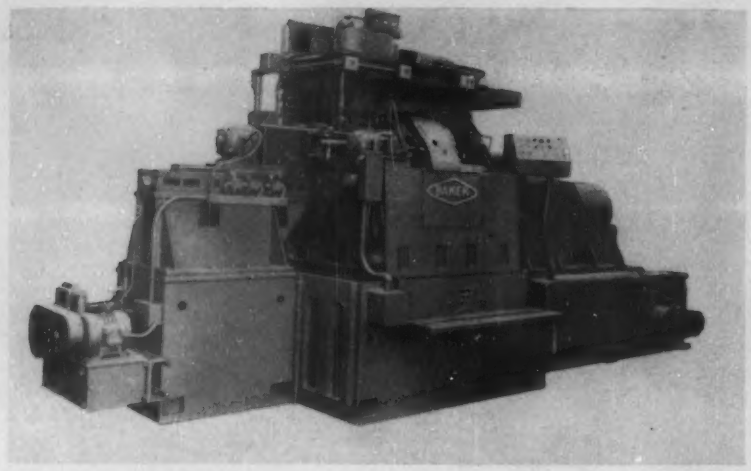
Based on compounds of hydrazine, these fluxes, called CORONIL, are non-corrosive and can be used without hazard. They remove oxides and other films from most of the commercially used metals such as copper and brass—as well as others—to permit more effective work and fewer rejects. Currently, these hydrazine-based CORONIL soldering fluxes are being successfully applied in the manufacture of automotive radiators and other heat exchangers, parts for the electrical and electronic industries, carburetor floats, oil strainers, and various other products where effective non-corrosive soldering is essential.

For additional information on hydrazine-based soldering fluxes, call your nearest Mathieson office or write today.

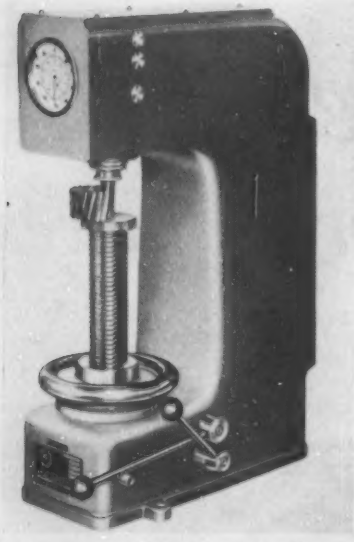
MATHIESON CHEMICAL CORPORATION
Baltimore 3, Maryland

MATHIESON

2503



FLOATING PISTONS for diesel engines are produced at rate of 41 parts per hour on this hydraulic feed Baker, single end machine with four-station trunnion and auxiliary single spindle unit at left-end station No. 4. Mounted to heavily constructed well ribbed steel end bed is floor type unit having 30 in. width of hardened steel ways in 60 in. length of saddle with automatic lubrication for saddle, ways and gibs. Available feeding pressure is 23,500 b.; multiple head unit is arranged for direct drive from main motor with provision for pick-off speed change gears—*Baker Bros Inc, Toledo, Ohio*

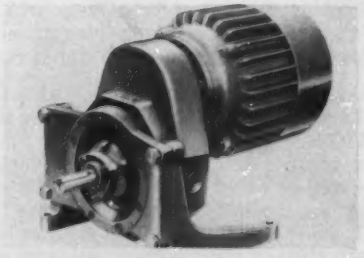


Improved Model of Hardness Testing Machine

Wolpert-Gries hardness testing machine, Model HT-1, can perform 400 tests per hour with 10-kg minor load produced by gravity. After minor load is applied, no setting is required. Without removing his hand from spindle wheel, operator can release oil brake applying major load through weight block suspended on loading lever. Oil brake speed can be adjusted and depth indication begins at once. When dial pointer has almost stopped, another lever removes major load while minor load remains. Final test result appears immediately.

Since indicator never requires adjustment, it retains its high precision. Special clamping cap eliminates errors caused by blacklash and improper clamping. Standard model can be adjusted to 100 and 150 kg major loads for Rockwell B and C tests.

Imported by Gries Industries, Inc, Testing Machines Div, New Rochelle, NY



Foreign Motors Now Meet NEMA Specifications

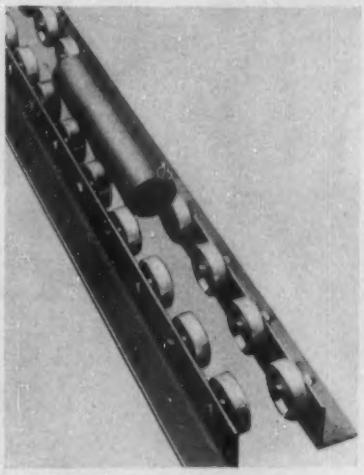
Line of geared motors manufactured in accordance with NEMA specifications by SADI is being introduced by the Belgian Electric Sales Corporation. Gears of SADI motors are of planetary construction and equipped with ACEC totally enclosed fan-cooled motors.

The planetary cells have no intermediary bearings—they have been engineered to close tolerances to permit slight drift of mobile components. Heavy-duty steel spur gears fit in with the design which precludes intermediary bearings. The oversized oil chamber has been engineered to reduce loss of viscosity of lubricating oil caused by churning and heating.

In horizontal mountings planetary gears are splash lubricated by partial immersion of gears in oil chamber. In vertical mountings plunger pump has been employed as effective lubrication aid. Plunger pump, driven by primary gear wheel shaft, provides balanced oil flow.

Power range from 1/3 to 15 hp., output speeds down to 0.31 rpm, reduction ratios as high as 3657:1 and three working positions and mounting arrangements are provided.

Imported by Belgian Electric Sales Corp, 40 East 49th St, New York 17, NY



Single-Rail Conveyor Units

Addition of line of Sage Wheelrail conveyor provides single-rail conveyor unit having many applications. Supplied as single-wheel rails, units can be spaced to suit individual requirements — may be bolted to table or floor or may be used with Sage stands. Cylindrical products can also be handled by spacing rails to fit.

Wheelrails are reported easy to install or relocate. When installed at floor level they facilitate handling by eliminating shoving and heavy lifting on level or inclined surface. Units are constructed of 2x1½x3/6-in. HR angle and are available in 5 and 10 ft sections. Heavy-duty, cadmium-plated ballbearing wheels are located in high position on 3-in. centers and grease-packed for life.

Sage Equipment Co, 30 Essex St, Buffalo 15, NY

Miller AIR CYLINDERS

In "Custom-Built" and "Stock" Models

Immediate Delivery on "Stock" Models!

Take your choice! . . . Get Miller quality-famous "Custom-Built" Air Cylinders available on normal, scheduled delivery in an *infinite selection* of bore-and-stroke combinations in 14 standard mountings . . .

. . . Or get identical quality "Stock" Miller Air Cylinders *ready for immediate shipment to you* in these popular sizes, strokes and mountings . . .

NON-CUSHIONED: 2", 2½", 4", and 6" bore sizes, each available in 2", 4", 6", 8" and 11" stroke lengths.

CUSHIONED BOTH ENDS: 2", 3¼", 5" and 8" bore sizes, each available in 3", 5", 7", 9" and 13" stroke lengths.

"Stock" Cylinders are base Model A53 with foot, flange, and pivot mounting attachments available as desired.

NOTE: "Stock" Miller Hydraulic Cylinders also available!

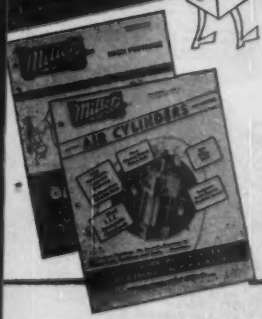
Write For Complete "Stock" List

HARD CHROME PLATED PISTON RODS
Prevent Scratch-Damage, Nicks and Rust

DIRT WIPER SEALS
Protect Rods, Seals, Bushings

SOLID STEEL HEADS, CAPS and MOUNTINGS
Eliminate Breakage

BRASS BARRELS
Eliminate Rust and Corrosion



WRITE FOR CYLINDER BULLETINS A-105 and H-104

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

MET J. I. C. PNEUMATIC STANDARDS years before their adoption in 1950.

SPACE-SAVING SQUARE DESIGN originated by Miller in 1945.

SALES AND SERVICE FROM COAST TO COAST

CLEVELAND • YOUNGSTOWN • DAYTON • PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY • BUFFALO • ST. PAUL • GRAND RAPIDS • DETROIT • FLINT • FORT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE • KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE • DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • TORONTO, CANADA and OTHER AREAS

MILLER FLUID POWER CO.
(Formerly MILLER MOTOR COMPANY)

Miller

2004 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

MUELLER BRASS CO. forgings* contribute to the efficiency of this modern waste disposal unit

***MUELLER BRASS CO. facilities include: designing, die-making, forging, tooling, machining, polishing, plating and assembly**

Three Mueller Brass Co. forgings play an important part in the fine operating performance of this modern waste disposal unit made by the Eureka-Williams Co., Division of the Henney Motor Co., Inc. This unit does a speedy and thoroughly effective job of pulverizing garbage and has made life easier for American housewives. The impeller disposer that chops up the waste food in the disposal unit, the disposer cover and the sink mounting flange are all forged by the Mueller Brass Co. This is another outstanding instance where Mueller Brass Co. forgings have improved product performance and cut costs. High quality forgings can be produced from standard and special brass, bronze and aluminum alloys. And in addition, the Mueller Brass Co. offers complete service ranging from product design to finished part . . . Write today for complete information and new 32 page forgings handbook.

1. Sink mounting flange, forged, machined, nickel and chrome plated by Mueller Brass Co.
2. Machined and finished disposer cover forging.
3. Cutting side of impeller disposer forged from 600 series bearing bronze.
4. Reverse side of impeller disposer.

MUELLER BRASS CO.

PORT HURON 23, MICHIGAN

ROUND TABLE *Discussion*

OVERTIME GOV'MINT

Is it good or bad practice to allow employees to use company equipment for private projects during off hours. What of the possibility of injury to the worker, or damage to the machine?

THE DESIRE TO USE company-owned machinery only stems from a few individuals. These people are those who feel that they like to create and develop tangible things. Usually they are beyond the hobby stage and require big-time machines to prove their ideas sound. However, this is not always the case, for occasionally an employee has the yen to work on an idea, but he has no equipment of his own, nor does he have the money for it, regardless of how few pieces are involved.

This desire to use other people's equipment is not limited to the machine tools in a plant. It happens in all departments, and the Engineering Department is one which rivals the machine shop.

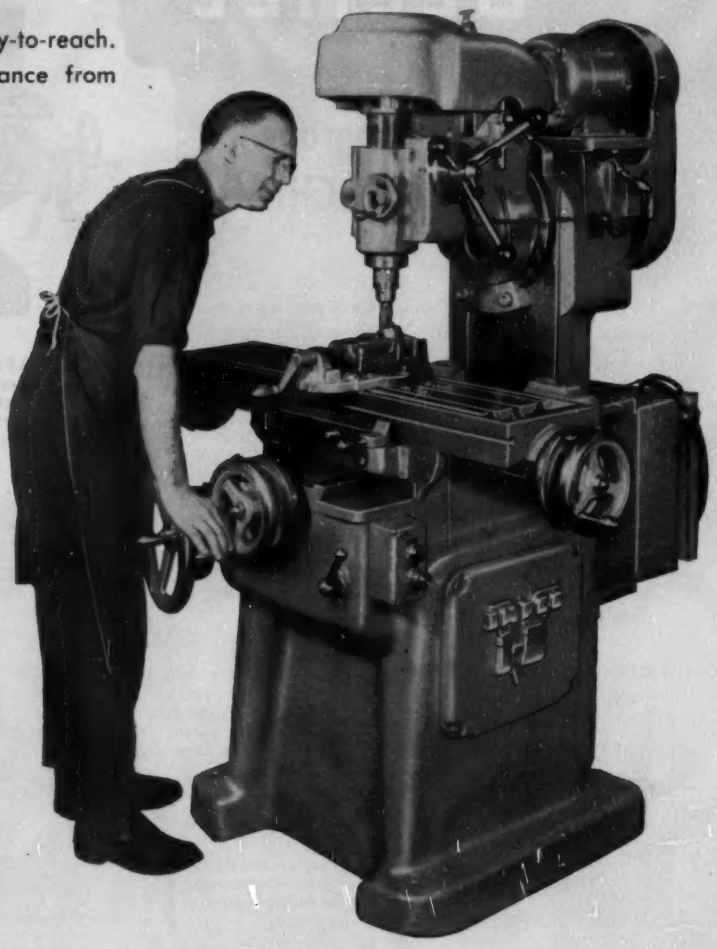
It certainly seems too bad to hold back those individuals who have a real desire to do something worthwhile. Yet many problems exist in trying to work out a plan that is sound.

Most of the ordinary working class feel that they are being discriminated against when the boss says no to the idea of letting them work either overtime, Saturdays, or on some other arrangement whereby they can use the equipment. Basically they are not being turned down as cold as they think. The risk to be taken by the company is too great in the company's mind to justify the approval to let the individual work on his

Here's New Operating Ease in a Vertical Mill

- The head of the IMPCo Model 1-B Vertical Mill is *vertically* adjusted by a counter-balanced ram. The table does NOT move vertically.
- A Shot-Pin gives positive vertical spindle alignment after angular milling operations *without indicating the table.*
- Controls are centralized, easy-to-reach. They remain the same distance from the floor at all times.
- Dials are extra-large, easy-to-read for greater accuracy and operating ease.
- One shot lubrication system.

Get all the facts. Write for Bulletin AM-103.



IMPCO

INDUSTRIAL METAL PRODUCTS CORPORATION

Builders of IMPCo Straighteners, the American HEB Pilot Lathe, and Special Machinery

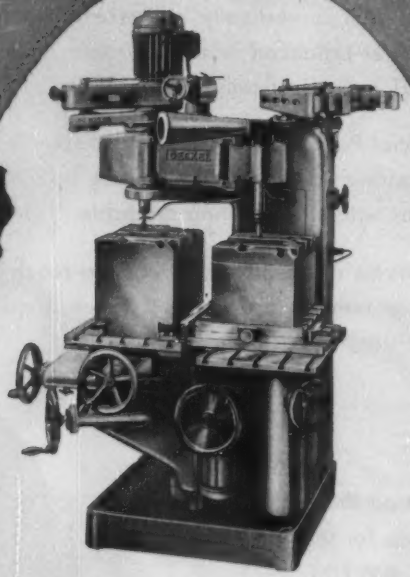
3400 W. ST. JOSEPH STREET **LANSING, MICHIGAN**

ECONOMICAL, ACCURATE PRODUCTION OF DIES AND MOLDS WITH THE LATEST

DECKEL

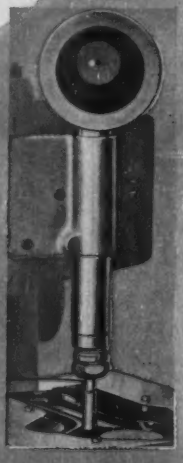
universal pantograph DIE SINKING MACHINE model KF12

Deckel die sinking machines are justly famous for their accuracy, production rate, and ease of operation. The KF12, latest and largest Deckel model, does heavy die-sinking jobs which formerly required much greater investment in equipment. Spindle speeds from 60 to 10,000 r.p.m. enable you to do rough and finish milling, as well as light engraving, on the same machine. The newly developed, "mirror image" milling attachment produces right and left hand dies and molds from the same pattern. Other important features are illustrated below.



Deckel KF12 makes rapid, accurate enlargements or reductions from 1:1.5 to 1:4 as well as 1:1 duplication. The cutting tool covers an area up to 15¾" x 15¾" or up to 10" x 19¾".

Optical contacting device makes rough milling faster, more accurate. And, accurate rough milling reduces time for finishing.



Saddle elevating motor rapidly raises or lowers master and workpiece at the same time.

Circular forming attachment permits generating spherical shapes.

Get in touch with us soon for information on this or other Deckel machines: 2-DIMENSIONAL ENGRAVERS • 3-DIMENSIONAL ENGRAVERS UNIVERSAL MILLERS • UNIVERSAL TOOL & CUTTER GRINDERS

COSA — *nationwide sales and service of precision machine tools —from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N. Y.

or her special project on company property. It must be remembered that a company must carry insurance to protect itself from suits by individuals who accidentally get hurt on company property. This insurance does not, however, allow for employees who are not working on regular shifts, but at other times. Therefore, when an employee not being paid to work, or who is using equipment, or is on company property, not at its request, is hurt, there is no coverage to protect either the individual or the company.

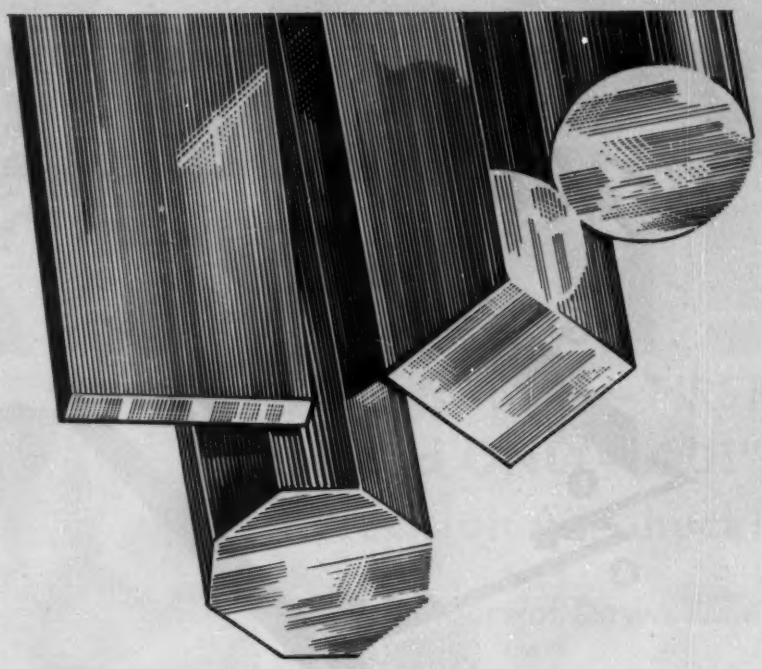
Probably the average worker, who is not tempted, would not make a fuss if he or she were to be slightly injured on a "government project." But temptation is there, and many would take advantage. In fact, cases have been known where the suit has so badly crippled the company that plant operations have ceased.

The world seemingly is filled with many persons who love to see others suffer so long as they can reap the benefits. The plans for allowing workers to use company-owned property are dangerous. Little can be done about it. Small jobs can sometimes be "run in" during working hours, but where a company is really busy, or is of considerable size, this cannot be allowed.

If individuals have really good ideas, they should discuss them with the officials and try to interest them in setting up a project to develop the idea. This would allow the company and the worker to join hands, and perhaps both would gain.

It is better to try to work out a compromise than to be sorry later on. This is the thinking of most companies today regarding the use by employees of company-owned equipment.

Charles D Townsend
West Hartford, Conn



Big enough to serve you!

small enough to give you
SPECIAL ATTENTION
on

WYCKOFF

COLD FINISHED STEEL

CARBON . . . ALLOY . . . LEADED

FULL COLOR
SPARK TESTING FILM
AVAILABLE

This fast, inexpensive, non-destructive testing method identifies metals by analyzing the elements present. The film presents some of the fundamentals.

Address requests for showings to our general offices.

EXPERIENCE means not only length of time devoted to the refinement of a product but includes, as well, the diversity of product requirements solved. **WYCKOFF**, throughout its history, has specialized in the production of fine quality cold finished steels—in all commercial forms and for the broadest range of specifications.

SPECIALISTS IN COLD FINISHED STEELS EXCLUSIVELY

WYCKOFF STEEL CO.

General Offices: Gateway Center
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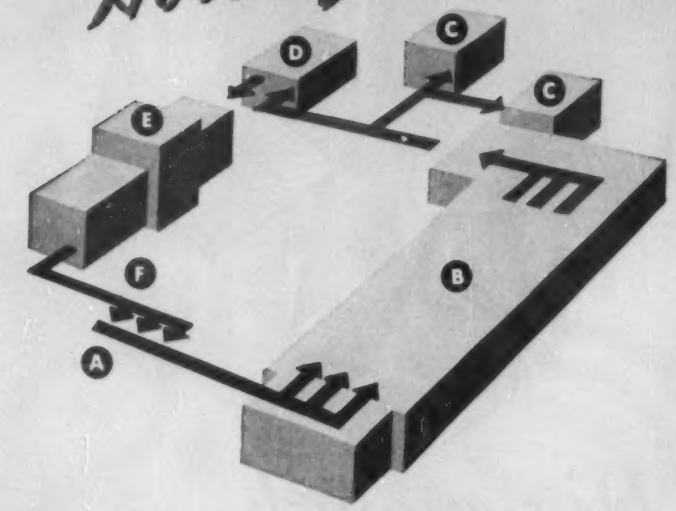
Works: Ambridge, Pa. • Chicago, Ill. • Newark, N. J. • Putnam, Conn.

WYCKOFF STEEL PRODUCTS: Carbon and Alloy Steels • Turned and Polished Shafting • Turned and Ground Shafting • Wide Flats up to 12" x 2" • All types of furnace treated Steels

Heat Treat Furnace Layout

by *Holcroft* ...8th of a Series



A Load
B 3-row Carburizing Furnace
C Press Quench Machines
D Quench Tank
E Both parts feed through single row draw furnace
F Unload

1 Furnace Layout Handles 2 Parts Saves time, man hours; cuts costs

Design experience paid off in this east coast plant. With two parts involved—both receiving the same heat treating cycle, but one requiring press quenching and the other selective hardening—the obvious answer seemed to be two separate layouts.

When given the problem, Holcroft engineers decided one layout would do. The work—drive gears and pinions—is now carburized in a 3-row pusher type furnace. After leaving the carburizing furnace the pinions are quenched by the tray load while the drive gears are individually press quenched and reloaded on trays. Both parts then continue on through the single-row draw furnace.

The results: substantial savings in both time and man-power.

Unusual? Not at all. Just another example of how experience and "know-how" pays off in time, money and job satisfaction.

Write today for complete information. Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Michigan.

PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

CHICAGO, ILL. • CLEVELAND, OHIO • HOUSTON, TEXAS • PHILADELPHIA, PA.

CANADA
Walker Metal Products, Ltd.
Windsor, Ontario

EUROPE
S. O. F. I. M.
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DECIMAL DITHER

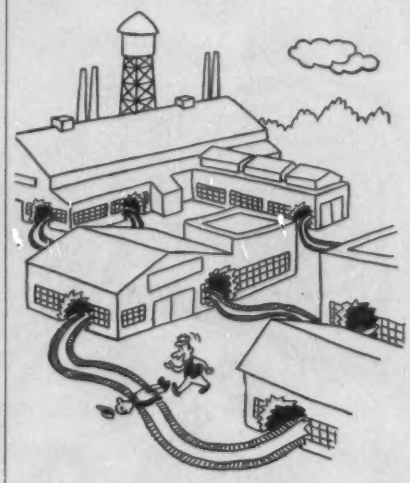
Which is easier for all-around shop use — decimals or fractions? Would the average shop man rather write or read a dimension as 33/64 in., or as 0.515625? Does the extreme accuracy of the decimal system counterbalance the familiarity of long-time use of fractions?

NOT SO LONG AGO a machinist's most important measuring tools consisted of a 12-in. scale, graduated in fractions to sixty-fourths of an inch, a pair of dividers, and some calipers. With these, the machinist was expected to, and did, work to rather close tolerances. Sometimes he worked to "within a hair" or to a "scant this or that." The parts he made usually fitted together because they were individually fitted to each other—the parts fitted all right, but they were difficult to duplicate unless the mating part was at hand. This "try and fit" method was accepted because the commercial need for anything finer did not exist.

Working to fractions today, when commerce demands closer tolerances in manufacturing, is like telling time by the hour glass instead of by a modern clock.

Fractional dimensions my be convenient for rough layouts or for estimating purposes; however, when parts are to be made which will fit together without individual fitting, the decimal system works better.

Since the operating dials on modern machine tools are graduated to read in decimals—and we have such fine instruments which measure in decimals—it seems foolish for anyone to object to the use of the decimal system.



"Did a drunk go thru here driving a fork truck?"

Buck DOES IT AGAIN!

Brings You the FIRST – and ONLY – .001" Precision Air Chuck!

• • •

Saves Hours of Down Time

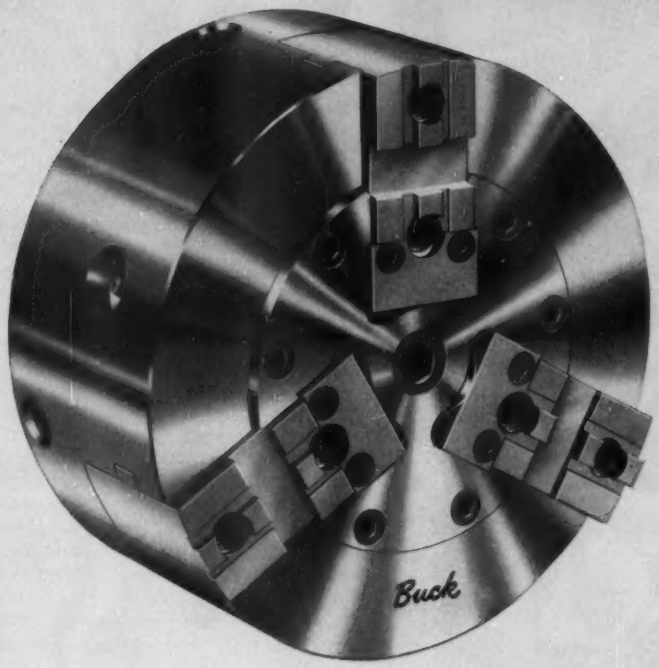
• • •

Permits Hardened Jaws for ALL Operations

• • •

10" and 12" Chucks— 2 or 3 Jaws

• • •



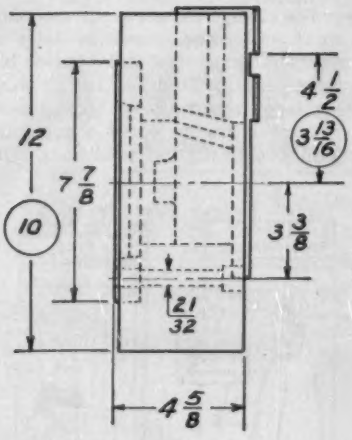
It looks like any other wedge-type chuck . . . operates much the same . . . but here, for the first time, is an air chuck that guarantees precision within .001" and practically eliminates down time.

It ends the time-wasting trial and error method of fitting jaws — the turning or grinding jaws on the chucking machines. Now, *jaws can be machined in the tool room while the automatics continue production,* because the final precision adjustment is made with the "Ajust-Tru" feature of the Buck chuck.

Now, soft jaws of quick wear can be replaced with hardened jaws — for holding rough castings or forgings for first operations, or the more critical second operations. The Buck also permits jobs and their jaws to run intermittently and interchangeably *without need to retrue the jaws* each time the job is set up.

The Buck can be adjusted while gripping work with full air pressure — to prevent inaccuracy. And for safety, it keeps its gripping power should an air line break exhaust the cylinder.

For accuracy and savings never before possible with an air chuck — get a Buck. *There's no price premium.* Send for literature with complete details.



Principal dimensions on the 10" and 12" chuck mounted to an A1-8" American Standard Spindle Nose.

CIRCLED DIMENSIONS FOR 10" DIAMETER CHUCK.

Buck AJUST-TRU® CHUCKS

The Buck Ajust-Tru principle is a unique chuck development.

Jaws grip work like any other scroll or air chuck. *After work is gripped* opposed screws near the back of the chuck are used *to move the chuck on the adapter* to bring work to dead true alignment. No further adjustment needed to chuck duplicate parts.

On hand-operated chucks jaws always come back to within .0005"— on air chucks to within .001".

Buck TOOL CO.

810-A SCHIPPERS LANE

KALAMAZOO, MICHIGAN

ONLY

GOSS and DeLEEUW AUTOMATIC CHUCKERS

offer the 1-2-3 feature

This NEW development—unsurpassed for speed, convenience of tooling and precise finish—involves no retooling problem even for short runs. It assures greater production at lower cost on all classes of work.

The unique "1-2-3" feature, exclusive with Goss & De Leeuw, provides the means for performing one to three right or left hand single or double threading operations simultaneously or in sequence, without changing set up.

Here's an ideal machine tool for small lot requirements because of quick, easy changeover. Any class of chuck work can be handled economically in any quantity.

The examples of work shown here are typical of the wider variety of parts being produced on these new machines.

SEND FOR detailed information on this new machine. Let us have samples of your work in order to give you time and cost estimates for handling it on the "1-2-3" Goss & De Leeuw.

GOSS & DeLEEUW

GOSS and DE LEEUW MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

The fractional system is well established however, and a complete changeover to the decimal system will take some time.

If a shop is going all out for decimals, the management should see to it that all fractional measuring devices are replaced with their decimal counterparts, even down to the 6-in. scale.

Consistent specification of decimal dimensions, plus the provisions for working to decimals, will soon eliminate any prejudices toward the decimal system.

Henry George
Dayton, Ohio

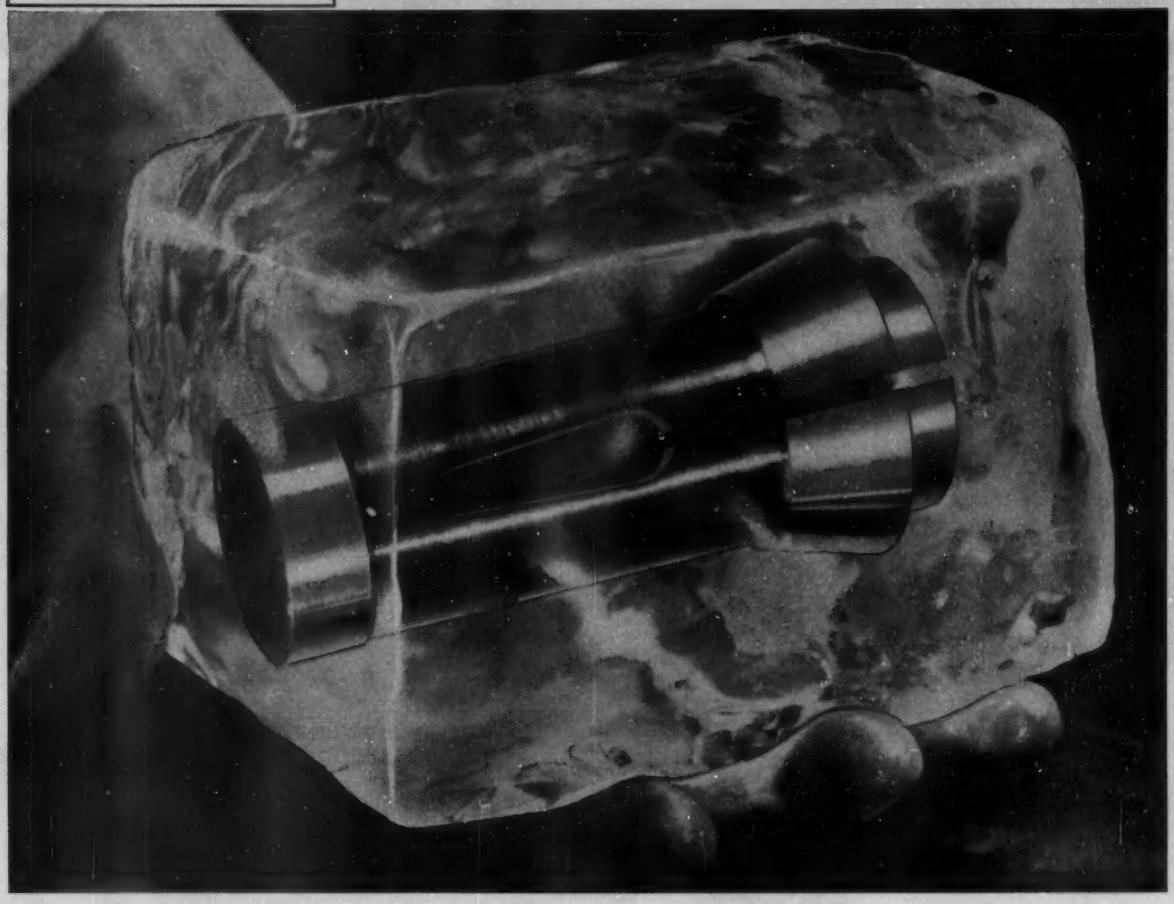
IF ED IN HIS LAST statement: "Fractions have been with us too long," had stopped there he couldn't have hit the nail on the head any better. For ever since the micrometer came into the shop and became a general measuring tool, fractions have been outdated. It was the young men then, who are the oldtimers now, who wanted and clamored for the metric system to end the confusion of reading fractional dimensions on the drawing and then looking up a chart to see what decimal equivalent they represented.

It was then that we threw away our last chance of having a measuring system based on common sense rather than on the length of somebody's foot because the oldtimers didn't want to change. With that chance gone, our modern manufacturing methods, requiring interchangeability and closer assembly stackup tolerances, just had to adopt the decimal system as the next best thing.

The change came here in our shop as it will come sooner or later to every other shop, not by choice but by necessity. The men in the shop, much to the surprise of the decimal-system critics, accepted the change with practically no resistance. Oh,

ANTISEP
All-purpose water-soluble base

—fortified for heavy duty machining



Parts come off cool . . . when

ANTISEP
All-purpose water-soluble base

is on the job!

You needn't sacrifice topnotch lubricity—nor anti-welding properties—to get maximum cooling ability . . . ANTISEP Base is what you need. Especially in high speed machining.

ANTISEP water-soluble cutting base carries heat away *fast* . . . so fast that just-machined work can be handled barehanded! And it's fortified to provide exceptional lubrication as well.

Put ANTISEP to the test on your toughest metal cutting jobs—notice how tools keep free of chip build-up—how parts come off with a finish to make any machinist proud!

Ask your Houghton Man . . . or write to E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa. . . . to arrange a trial production run in your plant.

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all-purpose water-soluble
CUTTING BASE
. . . a product of

E. F. HOUGHTON & CO.
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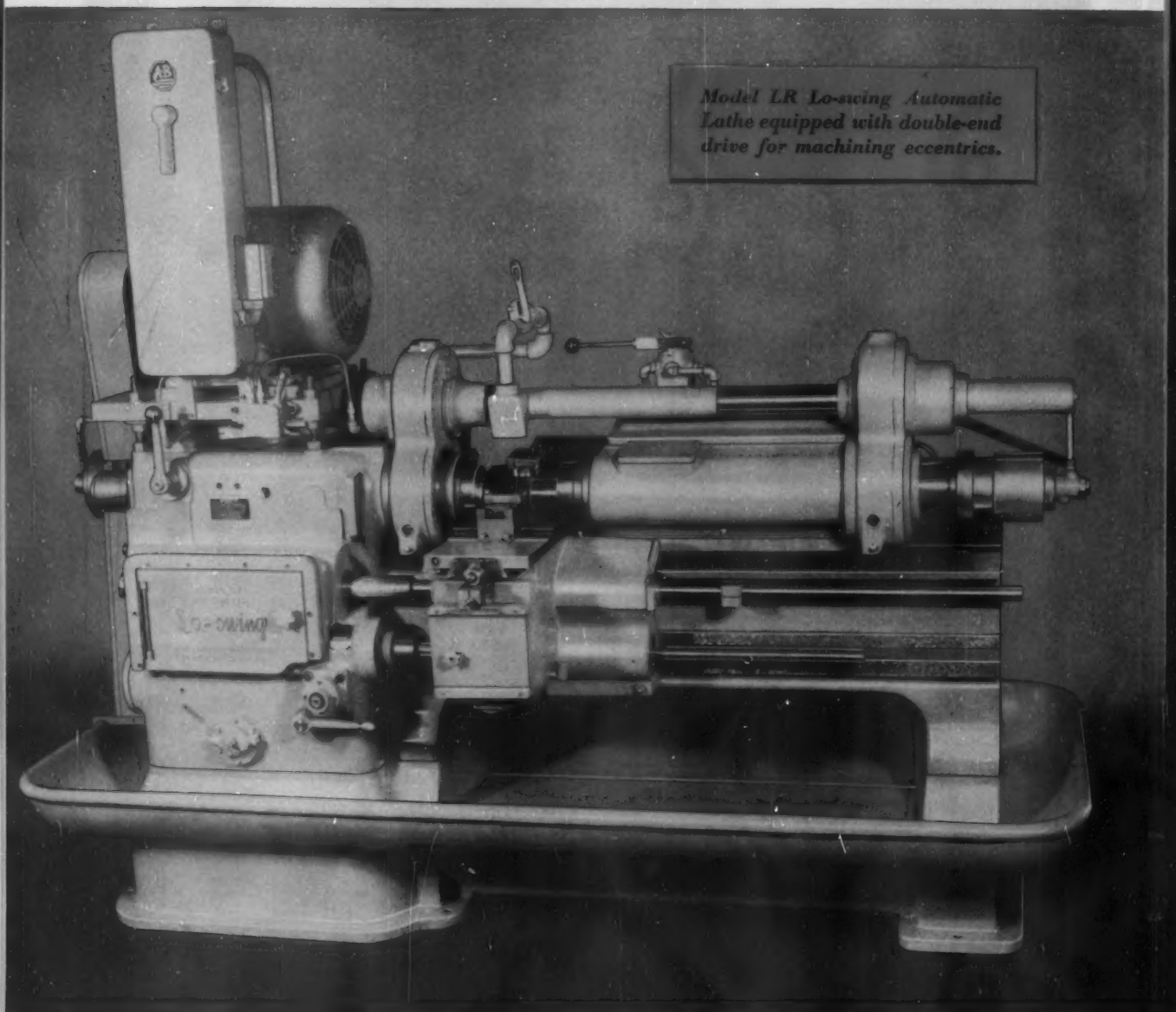
Ready to give you on-the-job service . . .

MACHINE OF

DOUBLE END DRIVE *Lo-swing* LATHE MACHINES ECCENTRICS AT A FAST PACE

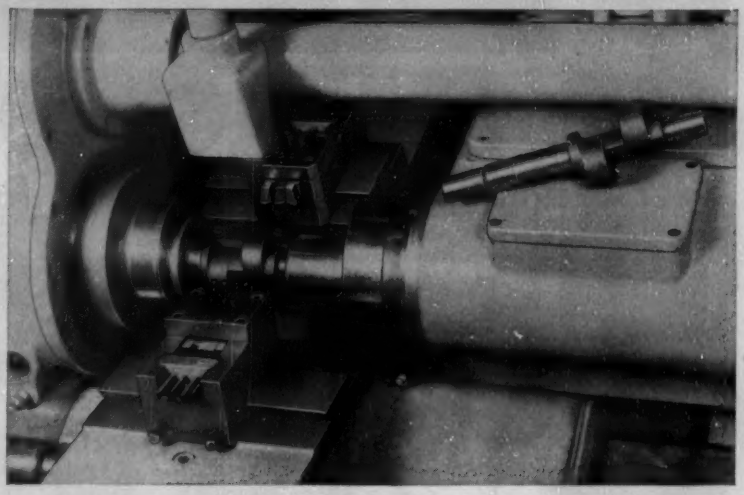


Model LR Lo-swing Automatic Lathe equipped with double-end drive for machining eccentrics.

PRODUCTION COSTS

THE MONTH

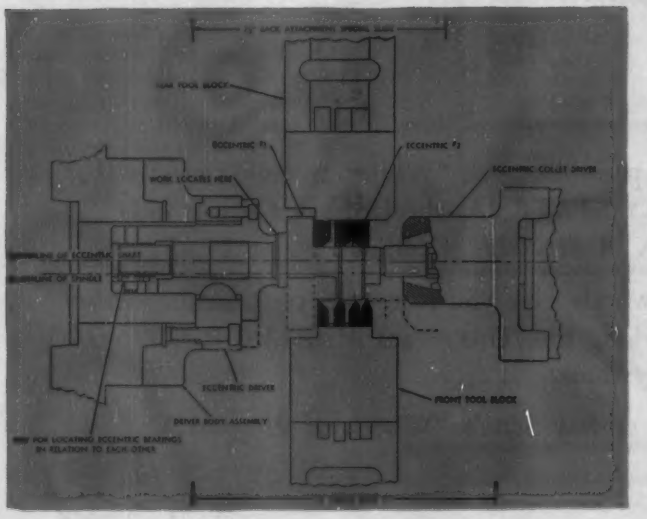
PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK



PROBLEM: To accurately machine eccentric bearings on compressor shafts within close tolerances.

SOLUTION: The Model LR Automatic Lo-swing Lathe selected for this operation was equipped with a double-end drive to prevent twisting or distortion of the shaft due to tool cutting pressures. The drive to the tailstock is taken from the headstock spindle and transmitted to the tailstock spindle by means of an overhead drive shaft. Special gearing eliminates all backlash.

The work is held and driven with offset drivers mounted on both the headstock and tailstock spindle noses as shown in the line drawing. The drive from the headstock end is through a key which positions the shaft in relation to either No. 1 or No. 2 eccentrics. The drive from the tailstock spindle is by means of an air-operated collet driver. Loading and unloading of parts is facilitated by an air-operated tailstock which retracts 6-1/2" by a simple movement of an air control valve.



The tooling used for this job is shown on both the line drawing and the close-up view of the operating area of the machine. The front tool block has four tools for turning the eccentric and the clearance diameters adjacent to the eccentric. The back squaring attachment carries three tools, one for facing the side of No. 1 eccentric and the other two for chamfering the edges of No. 2 eccentric.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

ARE LOWER WITH *Lo-swing*

Bay State 8A Vitrified Bonded Grinding Wheels

. . . Save 14%

Example: Basic† price of a premium-price "White" wheel 7" x ½" x 1¼" is $4.78. Basic price of a BAY STATE 8A wheel of same size is only $4.10. *SAVING IS $.68 ON A SINGLE WHEEL . . .* or 14%!

What's more . . . these 8A wheels give you fast, free, cool, cutting-action plus minimum dressing and long life. This means *MAXIMUM ECONOMY* for your tool grinding operations.

8A is still another example of Bay State's "Wheels of Progress!"

†Basic prices are subject to discount.

Send for literature which includes listing of stock wheels with proven specifications.

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BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U. S. A.

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Manufacturers of all types of Quality Abrasive Products

yes, here and there was one who just couldn't see why he, after years of experience and ability to do good work under the fraction system, should change. But would anyone want to change back now? Not on your life! Decimal dimensioning is so much easier and quicker to use that you can actually show savings in time and less scrap by making the change.

There is only one trouble with the decimal system we have today and that is it doesn't go far enough. How much longer will we have to wait until a group with courage, or because of necessity, will throw out the un-understandable number and letter drill sizes and substitute in their place decimal drills graduated in the preferred number system. I bet even Ed would go for that.

Charles L Sadon
West Lynn, Mass

I THINK ED'S REMARKS about metric markings reveal he doesn't understand how easy and economical the metric system is. And it is really to be regretted that the US as the first nation, after its originator—France—to accept the metric system didn't follow it up at the time of its introduction. Now, it is claimed, it's too expensive to change over.

Many years ago I read in this magazine that it did not matter whether the unit of measure was a tenth million part of the earth's quadrant or equal to the hind leg of an ass, as long as it could be duplicated. But a motivation of that kind is probably not the correct one. I wonder if it was not politically colored.

However, if the millimeter were the unit of measure in the machine building industries of America, as

"We've eliminated offensive fumes with this electrode, it contains chlorophyll."

Which of these jobs gives you trouble?

Oakite has 6 new ways to help you

Oakite chemists have developed efficient new materials for the six important jobs listed below. One of these new materials may provide the perfect solution for your most difficult problem.

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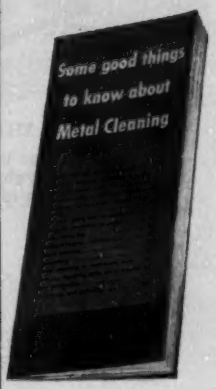
4 **ELECTROCLEANING BRASS:** Efficient, economical cleaning without danger of tarnish.

5 **INHIBITING PICKLE BATHS:** Liquid inhibitor for sulphuric, hydrochloric and phosphoric acids. Saves steel, saves acid, builds own foam blanket to suppress pickling fumes. Easy to add to continuous strip or batch pickling operations.

6 **STRIPPING PAINT:** Two solvent strippers for synthetic enamels and other tough finishes. One so viscous it adheres to vertical surfaces of objects that can't be stripped any other way.



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Hey! That's not the way to use Columbia's good FIREDIE Hot Header-Die Tool Steel.

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

Here's PROOF that ~~SPEED VISE~~ is a fast production tool

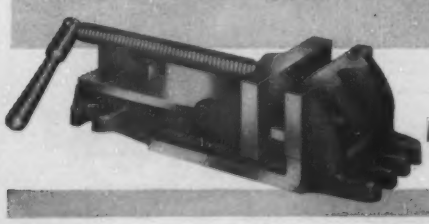
Here's a production set-up on a multiple spindle semi-automatic drilling machine that is really cutting manufacturing time and costs. The use of two Speed Vises eliminates the need for expensive and complicated fixtures and at the same time increases the production range. With Speed Vise it is only necessary to make a simple jaw plate to fit the parts being machined and to hold drill bushings, etc.

★ Quick action design for speed. Opens instantly to full capacity to handle work of any size.

★ Standardized holes for attaching jigs or jaw plates.

★ Lift...slide...lock...that's all there is to the fast, positive locking action.

★ Heavy, semi-steel castings for extra strength and a heavy base plate for rigidity.



Write now for Bulletin 30-AM

CARDINAL MACHINE COMPANY

1819 Dana Street, Glendale, California

it is in continental Europe, there would be no discussion regarding decimal or fractional inches. It is true that one might say one-half millimeter as well as one-half inch, but parts of a millimeter in engineering are always expressed in tenths, hundredths or finer decimals. It is far more economical to use decimal systems instead of fractions wherever it is suitable, not only for length measurements, but for all other kinds of measure as well. Compare the US unit of money to the English system!

Keeping strictly to the topic under discussion, the conclusion depends much upon what kind of production is done in Ed's and Al's shop. There are many kinds of jobs where fractional inches are plenty good enough, but in modern processes, as far as machining details for machine tools, automobiles, washing-machines, etc, are concerned, fractional inches are by far too coarse to be of any value. And producing interchangeable parts is quite impossible without using tolerances expressed in decimals. The old "running fit," "press fit," or other "fits" on the drawings is out of date at the present time. Young mechanics probably don't even know what such terms mean.

If Ed really means what he says—that he prefers to stick to the old system where fractional inches are used without special tolerances, he is out of date, too, and should either be sent to a course where decimals and tolerances are the main issue, or else be pensioned. Even a good apprentice would laugh at him. I wonder how Ed would go about grinding an interchangeable diesel engine pump plunger with a tolerance of say ±0.0002 inches without using decimals, or how would he express fitting the die and a punch closely without decimal tolerances?

Although a steel scale graduated

"You should have a place on that sheet for this operation, I'm sure."

MAXITORQ

Overload Release

CLUTCH

minimizes machine Down-Time

AT THE

GILLETTE SAFETY RAZOR CO.

The Maxitorq automatic Overload Release Clutch was designed especially to protect high-speed machinery, and we are gratified to have testimonials such as the following:

"The Gillette Safety Razor Company chose the Maxitorq Overload Release Clutch to protect a section of their blade and shaving cream packaging machines against costly down-time due to unpredictable machine jams.

"Over a period of a year, wrapping millions of blades per week, Maxitorq Clutches have eliminated machine down-time except in a few minor instances. Thus, more constant production has been maintained in the packaging department."

When an accidental overload occurs, the clutch automatically releases, stopping the machine, preventing damage to machine and product. When the jammed condition has been cleared, the clutch is re-engaged and the machine is again in operation. By means of a simple finger-tip adjustment, the clutch is set to transmit the normal running load.

There are six sizes, ¼ to 5 h.p. @ 100 r.p.m.; max. working torque ft. lbs. 13 to 263. Maxitorq "floating" discs prevent heating in neutral, and all assembly, take-apart, and adjustments are manual; disengagement is instant and complete. Submit your clutch problems to our engineers for practical solutions.

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8CJ53

THE CARLYLE JOHNSON MACHINE COMPANY

MANCHESTER • CONNECTICUT

Quality
MEANS
Low Tool Costs
Supreme
BRAND
Chucks

Taper Bore hardened and ground

Entire chuck body hardened —inside and out

Jaws nickel Chrome moly Alloy steel...

order from your *Industrial Distributor*

SUPREME PRODUCTS, INC., 2222 S. Calumet Ave., Chicago 16, Ill.
the chuck that lives up to its name . . . SUPREME

in fractional inches sometimes may be convenient for over-all dimensions, it cannot be used when accurate dimensions must be taken, and such measurements must be expressed in decimals. To save time and confusion it is better to use decimals for all dimensions on the drawings. If this is not done a man might have first to refer to a table to find out what decimals are included to set his mike to a certain fractional part of an inch.

I agree with Ed that it's no use to have decimal equivalent charts all around the shop. They are always a source of confusion and mistakes in precision work. They now belong to job shops where no precision measurements are involved. Forgetting the decimal equivalents of these charts is no loss when they are registered on the drawings for each corresponding dimension. Al is far more up to date than Ed when he suggests that the engineering department should take care of all the conversions involved when using inch-charts.

If Ed's boys resist a change from fractional inches to decimals, it is up to him to explain the advantages gained by the change. But I don't expect he will have much trouble. His men know when to use the scale and when to use the mike.

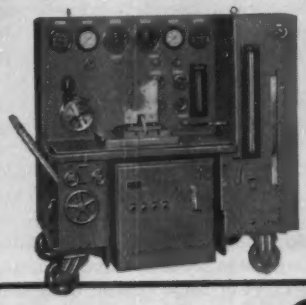
Once I was confused myself when designing tools after having been away from tool designing for many years. I found on my return that a new tolerance system had been introduced in the meantime, but it never occurred to me that I should oppose a reform that evidently was a technical advance both for the shop and engineering office. Ed's men are in a similar position, but they will accept if put before them in the right way.

Ed should drop his resistance instead of expecting too little response in the shop for this reform. Fractions are in most places a matter of the

"You clumsy idiot! You're spilling all my work . . . Mr. Barstow, Sir!"

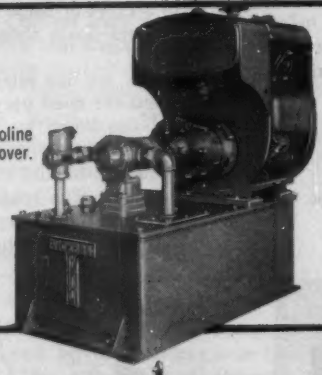
Pulpit type power unit provides full visibility, easy accessibility.

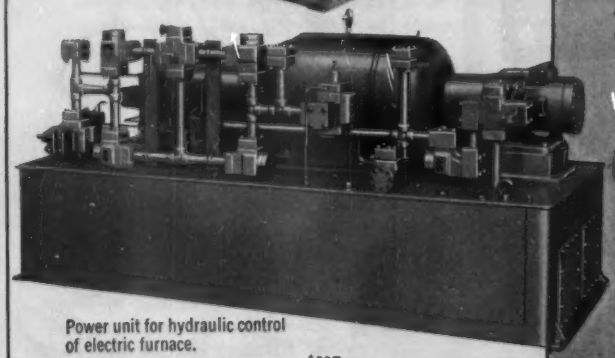
Compact power unit showing gasket-mounted valves.



Portable power unit for testing pumps.

Power unit with gasoline engine as prime mover.





Power unit for hydraulic control of electric furnace.

6837

Individually Designed to Meet *SPECIFIC* Needs

VICKERS® *Custom Built* HYDRAULIC POWER UNITS

DEPENDABLE PERFORMANCE

IMPROVE AND SIMPLIFY DESIGN

REDUCE INSTALLATION COST AND TIME

EASIER SERVICING

BETTER APPEARANCE

Vickers engineers approach the design of a custom-built hydraulic power unit from the standpoint of the customer's INDIVIDUAL needs. The sole objective is to meet HIS requirements with the best hydraulic "package". This assures the most compact, efficient and convenient hydraulic equipment for the particular machine.

A Vickers Hydraulic Power Unit includes all necessary pumps, valves, intermediate piping, oil reservoir, motors, controls, etc., as well as all hydraulic accessories (oil filters, air cleaners, oil level gauges, fittings, etc.). Hydraulic connections can be grouped in a convenient manifold.

In addition to the advantages mentioned above, each Unit is pretested at the factory and ready for immediate operation. Vickers undivided responsibility for the entire hydraulic control system is also an important feature to both the machine builder and his customer. Write for Bulletin 52-45.

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

There's a big difference *in floor absorbents*

Here's proof in a report from H. H. Rice—Master Mechanic in a leading rubber and tire company.
"After witnessing your comparative demonstration, we decided to use Eagle-Picher Industrial Floor Dry. The results have been highly satisfactory."

You, too, can witness the difference in floor absorbents! With his portable laboratory, your Eagle-Picher man will analyze your floor absorbent *right in your office*. You may actually conduct the test yourself! Without obligation, of course.

Here's what the test shows—

- The amount of oil and water absorbed for given bulk.
- The cost of your absorbent in terms of absorption and coverage.
- The amount of coverage you're getting.
- The benefits of your absorbent in terms of safety and reflective ability.

You'll see that Eagle-Picher Floor-Dry is insoluble, chemically inert and non-combustible . . . that it combines light weight for exceptional coverage with light color for brighter, safer working areas. Write today for the full story.

EAGLE-PICHER INDUSTRIAL FLOOR-DRY No. 85

EAGLE EP PICHER Since 1843

THE EAGLE-PICHER COMPANY
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past and have in many shops and factories been superseded by decimals a long time ago. He is entirely too pessimistic about shop acceptance of the new system; it has already been accepted more or less all over the world, and will subsequently dominate the whole machine-building industry before long.

There is no reason we should hang on to fractions because they have been used for such a long time. Decimals and decimal tolerances on the drawings are really easier, quicker, and safer to use and should therefore generally be accepted.

A E Fristedt
Stockholm-Bromma, Sweden

IN THIS PARTICULAR CASE Ed is too pessimistic about the shop acceptance of decimals. This writer was brought up in the fractional school—the same school as Fred Colvin. In that school most of the drawings did not have tolerances on them, or a few dimensions had tolerances, and those tolerances were fractional and unilateral. Very rarely was a tolerance of as small as 1/64 in. used. Along those lines, it is easy to remember certain individuals who were noted for their ability to read sixty-fourths accurately on a steel rule. It is pure vanity that makes me recall the pride I felt when older men started asking me to set their outside calipers to 5 17/64 or some similar dimension. I could do it then easily without a glass.

Yes, we had micrometers, but they were not used very often. When we did use them, we first had to translate the fractional dimension into thousandths and then work from the decimal. The majority of our work was done with plain inside and outside calipers. The best mechanics

"DE-licious! Your own recipe?"

A Mechanical Eye to Watch Your Tools

Cross Machine Control Units Reduce Downtime and Tool Costs

(U.S. Patent Nos. 2679038 and D-163935. Others Pending.)

The Machine Control Unit was originated by Cross to solve tool changing and down-time problems in machines with multiple tooling.

Available for drilling, milling, boring, turning and similar machines, the Control Unit provides many benefits:

- ★ **It reduces tool expense by minimizing breakage and grinding.**
- ★ **It is equipped with Toolometers which automatically stop the machine when tools need changing.**
- ★ **Other tools indicated by the Toolometers as *almost* used up are replaced at the same time. This grouping of changes drastically reduces downtime.**
- ★ **Pre-set tools are stored in the Machine Control Unit for instant availability at the machine.**
- ★ **Standard fixtures and gages are provided for pre-setting the tools to eliminate downtime for machine adjustments and trial cuts.**

Over 300 Cross Machine Control Units are now successfully reducing manufacturing costs in plants throughout the country. It will pay you to write, wire or phone for full information *today*.

Master tool setting fixtures and two standard types of gages for pre-setting tools.

Established 1898

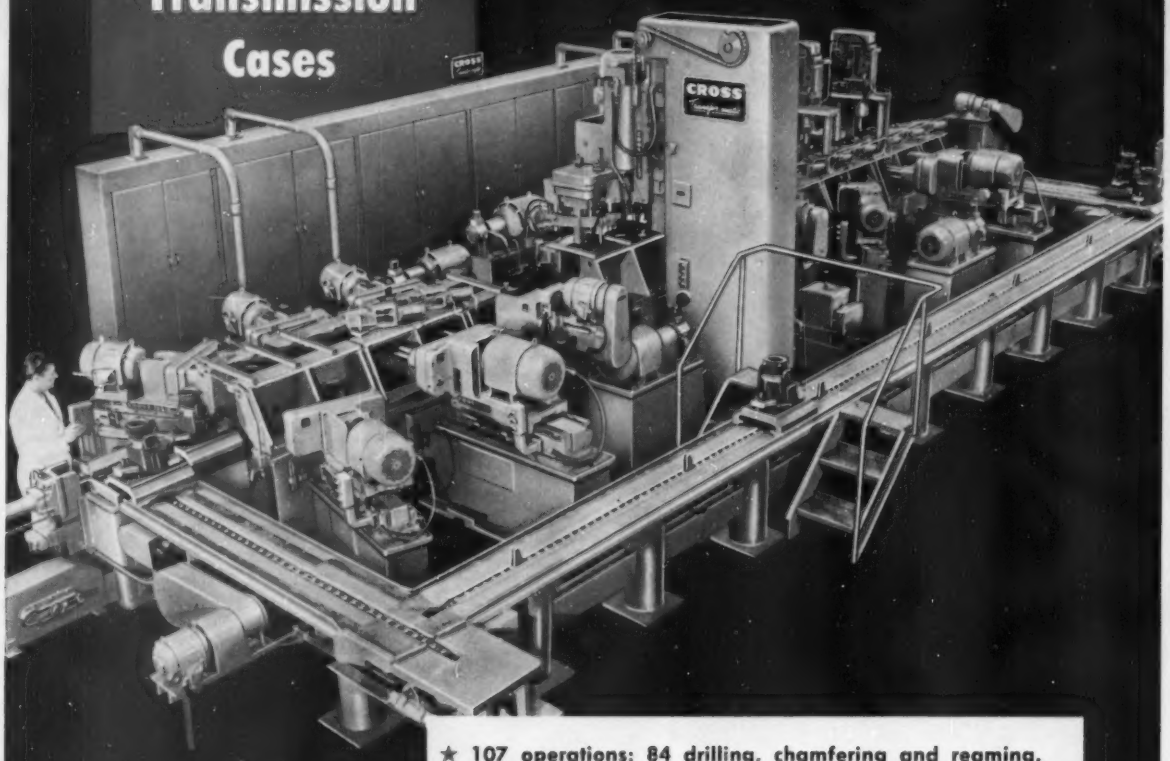
THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

Drills, Bores, Reams and Taps Transmission Cases

Another Transfer-matic by Cross



- ★ 107 operations: 84 drilling, chamfering and reaming, 8 spotfacing and counterboring, 4 boring, 6 tapping, 5 inspection.
- ★ 95 parts per hour at 100% efficiency.
- ★ 21 stations: 1 for loading, 1 for unloading, 15 for machining, 4 idle.
- ★ Machine stops automatically if critical tools are broken or improperly set for depth.
- ★ Pallet type work holding fixtures with automatic transfer from station to station and integral conveyor for automatic moving from unloading to loading station.
- ★ Complete interchangeability of all standard and special parts for easy maintenance.
- ★ Other features: Hardened and ground ways, built-in chip conveyors, hydraulic feed and rapid traverse, individual lead screw feed for tapping, automatic lubrication and J.I.C. construction.

Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

worked to attain a certain "feel" as they called it, of the caliper's resistance met in sliding over a surface. Many of us could detect one-thousandth of an inch difference in the OD or ID of a piece of metal merely by the amount of resistance offered to the caliper as it slid over the surface. And I can still do it.

Let it be understood that I am not talking about Brown & Sharpe, or some other tool company. I refer to railroad shops and general foundry and machine shops of the type I worked in. Forty years ago, those folks had little truck with decimals.

Today that is all changed, and for the better.

We have better instruments for gaging fine dimensions these days, and we have that supreme accomplishment for duplicating dimensions —gage blocks. The difference between fine- and medium-grade work is a matter of thousandths and tenths, not thirty-seconds or sixty-fourths. Therefore dimensions and tolerances are rightly expressed in decimals. I get in many shops and I have heard no complaint about the use of decimals. Decimals are as essential in the shop as salt is in the home.

United States Ordnance drawings, as well as the drawings of many other institutions have a sub-block inside the main title block that reads:

TOLERANCES ON Decimals——
Angles—— Fractions——

Unless otherwise specified, dimensions are in inches

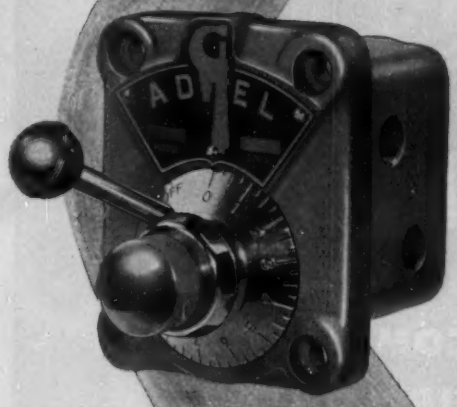
That takes care of all cases. Some drawings have no angles. Some drawings need no decimal dimensions. Some drawings require both decimal and fractional dimensions. Some drawings need no fractional dimensions. The designer knows just where the part has to go and the exact quality of fit needed. It is always understood among draftsmen and designers that it is definitely unkosher to use decimal dimensions where they are not needed. We want our lathe spindles held to tenths, but who cares if the handle on the carriage control wheel varies a sixteenth more or less on its diameter.

To me, this whole matter seems simple. Today I drive a Dodge; no doubt the Rolls Royce is much harder to drive than a Dodge, but when my employers provide me with a Rolls Royce and insist that I drive it, or else—why I'm just going to be brave and stagger along under that load like a man—after all, it's my bread and butter, and every man should respect his bread and butter.

James K Matter
Detroit, Mich

THE NEW **ADEL**

FLOW CONTROL VALVE FOR VERSATILITY



Adjustable from completely shut off position to 25 G.P.M. maximum flow. Will maintain constant fluid flow and constant machine feed over a wide range of pressures and feed resistances.

The diagrams show but two of innumerable circuits and systems where this versatile and better valve can be used to advantage.

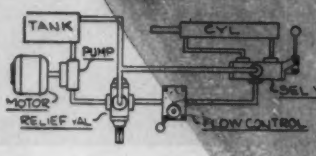


Diagram illustrates typical circuit showing control of cylinder.

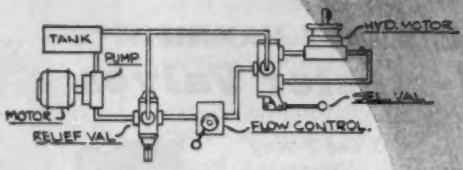


Diagram illustrates typical circuit showing control of hydraulic motor.

8 model variations are available—¼ in. Pipe Size—1, 2, 4 & 6 G.P.M. Flow Max. ½ in. Pipe Size—10, 15, 20 & 25 G.P.M. Flow Max.

CHARACTERISTICS

1. Valve is compensated type which maintains substantially a constant flow regardless of variation in inlet and outlet pressure.
2. Maximum recommended inlet pressure 1500 P.S.I.
3. Maximum recommended outlet pressure equals inlet pressure minus 100 P.S.I.
4. No drain line required.
5. Wide range of control lever rotation (270°) permits extremely accurate flow settings.

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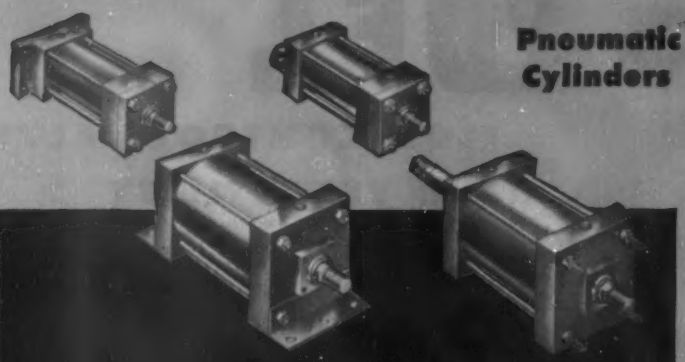
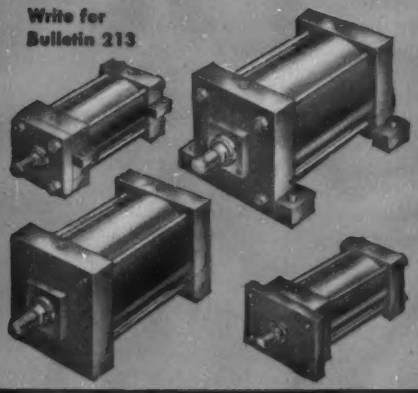


Pneumatic Cylinders

Hannifin Series "A" Square Type Pneumatic Cylinders are made in 11 bore sizes from 1½" to 14"...are available with 13 standard mountings, many combination mountings. All tooling is to extremely close tolerances to insure accurate, easy mounting. Cylinders are micro-honed and piston rods are ground and polished. Heavy-duty tie rods. Exclusive bronze cartridge gland is easily removed without dismantling the entire cylinder.

Write for Bulletin 213



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Piston-operated poppet design. Exclusive replaceable cartridge for easier maintenance. Speeds to 600 cycles per minute. Pressure from 15 to 150 p.s.i. Integral, solenoid-controlled pilot heads or a choice of 10 separate pilot valves for remote control.

- Fewer Valves to Stock
- Fewer Parts to Stock
- Maximum Interchangeability
- No Springs in Main Valve

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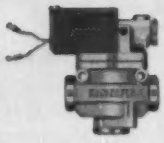
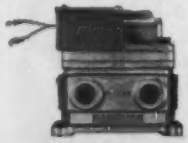
2 and 3-Way Valves.

Same valve operates 2-way or 3-way, normally open or normally closed. ⅜" to 1¼" I.P.S.





4-Way Valves.

Two 3-way valves mounted in compact, common body. Two piston poppets. Two cartridges. ⅜", ½", ¾" I.P.S.

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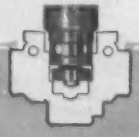

AIR WARDEN

Air filters, pressure regulators and lubricators to protect air operated equipment. Bulletin 10108.

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Designed for smooth, positive and accurate control of air-operated equipment. Bronze discs lapped to perfect seal with seats. Packless design. For hand, foot or electrical operation. Sizes: ⅛" to 1¼" I.P.S.

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SETUP STEW

Is there danger of friction between union and non-union men if the Master Mechanic's Office insists on doing special setup work in the shop? What's the best way to handle it?

I DON'T quite understand the disciplinary situation in Al's shop judging from his griping about the master mechanic's office. If this office is interfering with Al's ways of directing the jobs in his shop, then the management at his place don't know much about shop organizations. Don't they understand they are ruining Al's interest, and creating an unbearable situation between the foreman and his men? Setting aside such important disciplinary principles doesn't only concern Al and his three setup men, but the whole crew.

If the MM's office has authority to go into Al's department and order non-union men to do work the union might object to, it is also their duty to assume responsibility for the trouble that might develop. If management doesn't understand disciplinary matters better than letting the above occur, then they have proven their own inability to run any shop. Clear lines must always be drawn for each man's authority and duty, otherwise the result will be chaos. The only excuse for the MM's to butt in in this case is that they don't know Al already has three capable setup men in his department. Why doesn't Al report the situation to the superintendent and ask that it be corrected?

If particular setups are required which the ordinary setup men cannot master, it is up to Al to make special arrangements in each case. It is absolutely wrong if MM's office has been given authority to make setups in Al's shop without him knowing it.

Al's worry about anticipated trouble with the union should be taken

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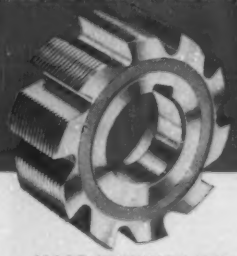

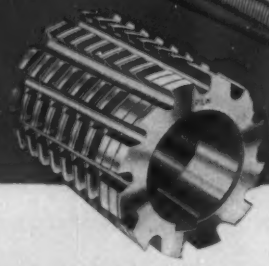

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rather seriously. Not because the union has any right to butt in in a case like that, but because there is a risk that they'll do it anyway.

I don't blame Al for being sore about the MM boys under the conditions at hand, but the blame should be addressed to the management. The disturbances in the setup work probably does much more harm than it speeds up production. If the MM fellows are really good at setting up, so that Al's ordinary setup men can learn something from them, then an instruction course with the MM's as instructors, should be run under conditions that would be beneficial to the setup men without stirring up union resentment. On the other hand, if Al can stack his ordinary setup men against any in the whole shop, then it is utterly wrong to force other men on him for duties he can take care of himself.

It is wrong of Ed to call Al's reaction a bit of jealousy. I'm pretty sure Ed would get the same feeling if he were treated the same way. I don't think the loss of prestige Al claims his setup men are facing amounts to much. The one losing prestige is Al himself. As I see his situation, the management is losing confidence in Al, when they let such things happen, and that is much more serious than the setup men's prestige. If no trouble develops due to the MM's action, it certainly has nothing to do with Al's starting such trouble as Ed suggests. If he really thinks so he must be very inexperienced with shop organizations and unions. I can't explain this situation in any other way than suspect that management purposely put Al in this spot either to give him a lesson that he is not indispensible, or else give him a hint to leave.

However, should this so-called special setup occur only once, Al might be able to overlook it and explain the situation to the shop steward and avoid trouble, but if the MM setup boys butt in time and again, difficulties are sure to turn up.

Once I had to face a situation similar to that of Al. Thinking it was a temporary mistake by the manager, I pretended I didn't understand the situation. But when I noticed the thing being repeated, I understood there were more serious reasons back of what was happening—the manager didn't practice the principle of the eighth commandment, which according to Luther reads: "Thou shalt not bear false witness against they neighbour." Instead he was after my scalp. Perhaps Al is in the same situation.

A E Fristedt
Stockholm-Bromma, Sweden

WE AGREE with Al in his size-up of this situation. A look into the foreman's crystal ball reveals the facts to be on his side.

The attitude of union officials can change suddenly, especially when an election comes up or a contract is to be negotiated. Political expediency will result in the issue of such war cries as:

"Non-union men, free riders, doing our work!"

"Cost reduction, phooey; they wanna break up the union!"

"Why put higher rated men on set-ups and have our boys run errands? The Foreman admits his men can do the work!"

Al is also right from a human relations' standpoint. Skilled workers have pride, a desire to be appreciated, to feel and be important. They are just as emotional as they are sensible. They do not get a feeling of satisfaction when some one else is put on their job.

Let us remember that Al needs satisfied workers to get out his production. Let us also remember that Al would rather prevent a grievance than settle one.

Peter A Seward
Swampscott, Mass

IN THIS fine country of ours a man has the freedom to be enterprising. This is every individual's right—to have freedom to do things. There are thousands who have been successful and thousands who have gone broke. Although we have the freedom to do things, there is no such thing as free enterprise.

In the old days it was possible to start in business on a shoestring. Today it costs a lot of money even for a small business. When a man builds up a successful business he wants to run that business without interference. It is his enterprise and invest-

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Two other alternate types for checking external threads are also available. All four are approved by the Air Force, Army and Navy as meeting their inspection requirements.

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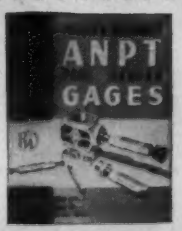

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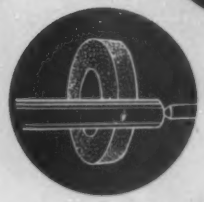
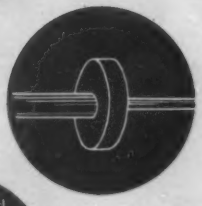
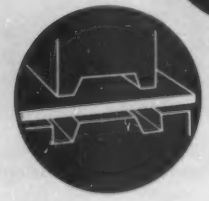


GRINDING



DRAWING



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READING, PENNSYLVANIA

ment which built up the business. It is natural that he does not want some individual or group to tell him how to run it. If it is a union shop, we have labor agreements. Policies are established and there they are. Once procedures and policies are established, every person in the organization is responsible and should be held responsible. Practices must be held in line with policies at all time.

If there is no rule covering the master mechanic doing setup work, there should be no gripe. The setup man gets the machine lined up, ready for production. The master mechanic is paid a higher rate according to his capabilities. If the top brass want to know how long it takes to do a job, they are certainly entitled to know. If the master mechanic can find a better way to do the job, or can redesign the fixture for a faster setup, every one eventually profits. We are all working toward the same goal. The profits of an organization support us all, and anything we can do to help is a possibility for increased earnings.

A E Salmons
Philadelphia, Pa

WHEN methods or process men come into the shop it is usually for the purpose of initiating a new idea or process, or to prove a new setup which had originated in the master mechanic's office.

In many cases it becomes necessary for the methods men to roll up their sleeves in order to work out the bugs which usually accompany the program of getting a new project started. Such situations are recognized and worked out harmoniously in plants where tactful supervision and union representation are existent.

From my experiences, the most important principle to be used in avoiding conflict and confusion is to resort to good organizational practices or teamwork. Such is the responsibility which a master mechanic must assume in carrying out a project. By that it is meant that satisfactory arrangements must be made with the departmental foreman when specific equipment is required for testing newly-developed setups. This practice affords the foreman the opportunity to plan for the purpose of avoiding production holdups and confusion during the periods when new methods are tested.

Insofar as who is to do the actual setup work is concerned, the nature of the new setup should be considered. If it is one that a qualified setup man can handle, it would be tactless on the part of the master mechanic to interfere. The time for the methods men to roll up their sleeves is if and when the setup man fails to work out the operation.

In summarizing the problem, pitfalls such as loss of production, which aggravate foremen, must be avoided since they are held accountable for production performances. Secondly, loss of incentive wages by idle personnel is demoralizing and opens a channel for grievances. If these factors are considered when new methods are contemplated, they will insure foremen - cooperation and minimize labor difficulties.

Peter L Budwitz
New Britain, Conn

"The boss told me to tell you he can't use a left-handed monkey wrench. He's right handed."

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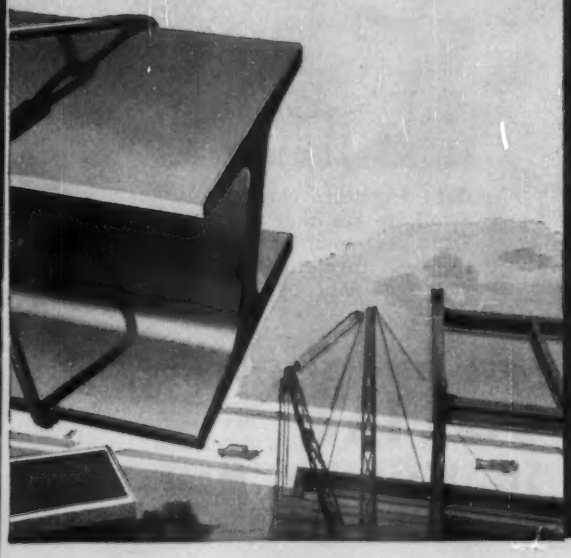

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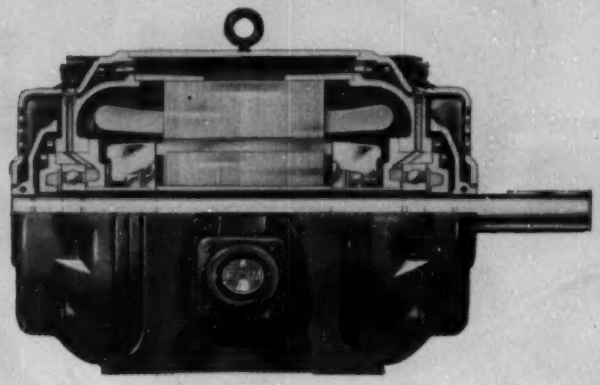

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STANDARD PRACTICE MANUAL; OUTSIDE MACHINE SHOP—NORFOLK NAVAL SHIPYARD, PORTSMOUTH, VA — *available from the Office of Technical Services, US Dept of Commerce, Washington 25, DC (Commerce Bldg, Rm6227). 128 pages, 8½ x 11 in. Mimeo. Price, $2.*

This manual describes standard procedures used at the Norfolk Naval Shipyard to control and plan repairs for naval ships entering the yard. Included are descriptions of routines to be followed, process and procurement methods, and detailed job descriptions for shop personnel, from shop master to quartermen and leadmen.

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THE TECHNIQUES OF SUPERVISION—*By Alfred R. Lateiner. Published by National Foreman's Institute, Inc, Arthur C Croft Publications, 100 Garfiield Ave, New London, Conn. 200 pages Price $4. (cloth), $2 (paper bound).*

This is a foreman's book; a guide to foremanship, and a job-instruction text that covers its ground in a practical, easily understood manner. Most important, the book takes a tack at foremanship training from the human standpoint, attempting to relate all problems to the human sources involved.

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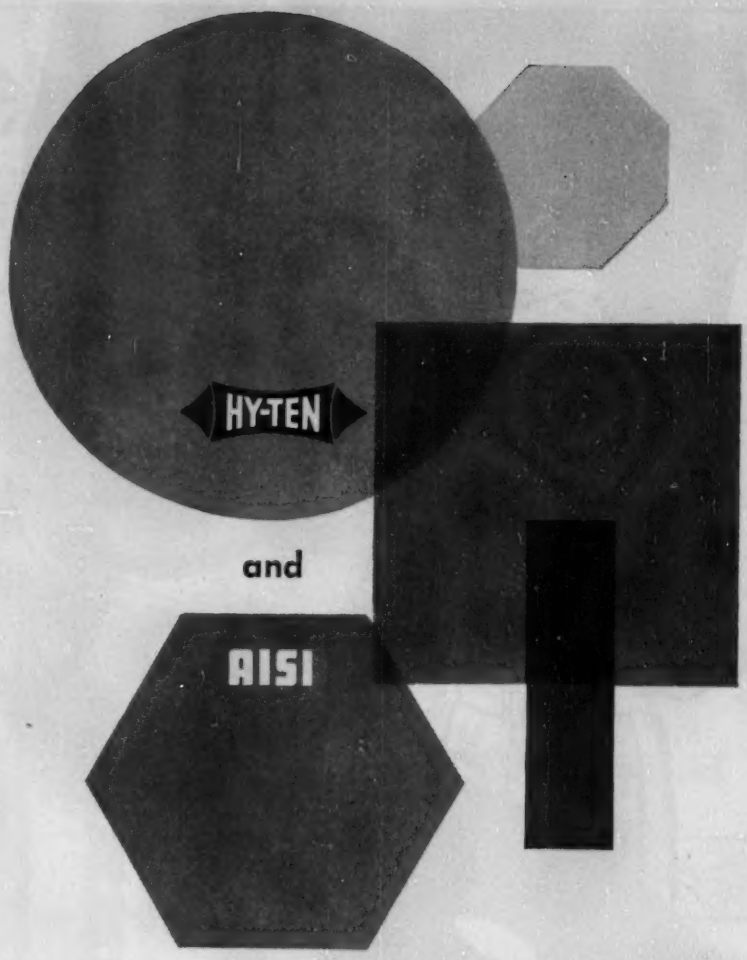
2. Be frank in admitting your own errors.
3. Establish a receptive frame of mind by getting "group think" decisions before putting them into effect.
4. Learn to say no sympathetically.
5. Dramatize what has to be done so others will understand it.
6. Set up challenges to develop enthusiasm.
7. Praise people in advance so they will try to live up to your expectations.
8. Ask for help instead of demanding it.

Improving morale, accidental control, employee training, solving a problem, and simplifying work methods are among the other general subjects covered.

To guide the foreman in his job, important note is taken of the fact



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that the foreman is responsible to his workers, as well as to his company; and that his reputation depends on what they do. A foreman is less necessary than workers, although he is important, and one of the aims of the book is to establish this point and show how the foreman can live with it and get along with the shop group.

Actually, the book covers how to win workers and influence production, and does it in a straightforward, valuable way.

•

INDUSTRIAL DIAMOND TRADE NAMES INDEX (5TH EDITION)—*Compiled by Industrial Diamond Information Bureau and Industrial Diamond Review. Published by NAG Press Ltd, 226 Latymer Court, London W 6, England. 124 pages 8¼ x 5½ in. Paper back. Price 3/6 (50c)*

First published in 1945, this index has been thoroughly revised and now contains about 2500 trade names. A data sheet supplement gives information on a number of subjects of interest to users and producers of diamond tools. Physical and chemical properties of diamond, crystallography, and the care of diamond truing tools, shaped diamond tools, and glazier's diamonds are covered. Other valuable information includes a list of diamond tool standards, as established in England and other countries, and a comparison of fine sieve sizes.

The trade names index gives the registered trade names, as well as generally used abbreviations and names of companies which have a special standing in the trade. A classified index facilitates finding the trade names used in any particular branch of the industries which use and work hard materials.

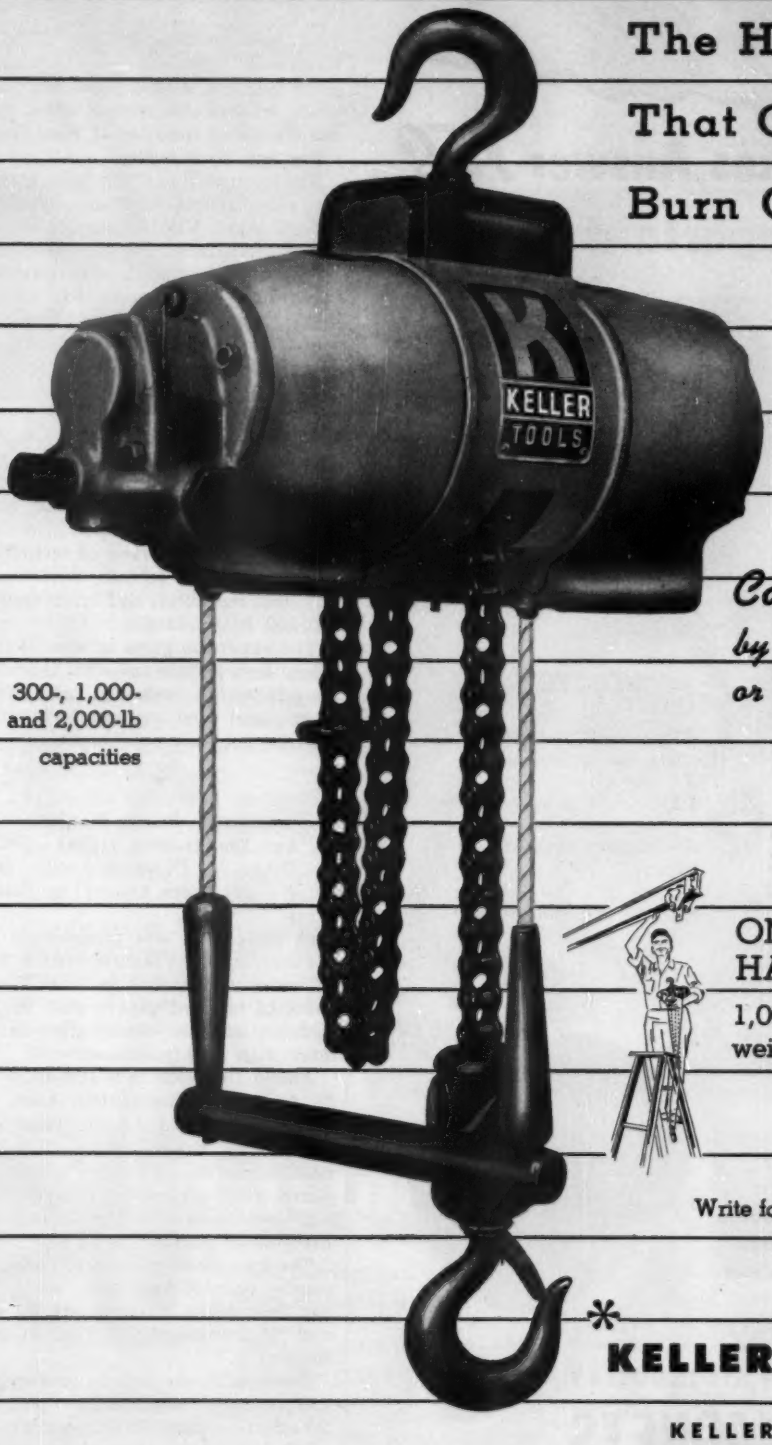
•

METALS TECHNOLOGY — *Edited by Alfred Borneman, professor of metallurgy, Stevens Institute of Technology. Published by American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. 109 pages, 8½ x 11. Price, $3.*

This book is intended as a comprehensive guide for teachers in vocational and technical high schools, in giving students a fundamental understanding of metals and their behavior. Detailed laboratory exercises and experiments are provided for 24 operations, plus a classification of metals and alloys, and micrographs.

KELLER

The Hoist That Can't Burn Out !



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from rapid reversals

Can't Be Damaged
by continuous service
or stalling under load

300-, 1,000- and 2,000-lb capacities

ONE MAN HANDLES IT EASILY

1,000-lb hoist weighs only 28 pounds

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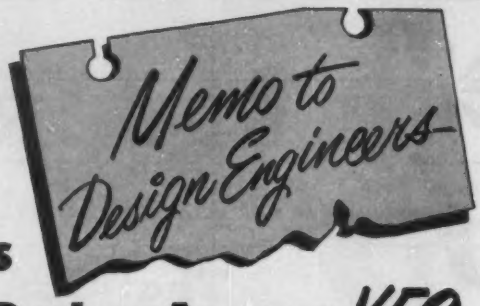
KELLER AIR HOISTS

KELLER TOOL COMPANY
1303 FULTON ST., GRAND HAVEN, MICH.



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✓ Torque ratings range from 1 lb. ft. to 575 lb. ft. covering brake requirements on motors from 1/20 hp. to 100 hp.

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✓ Operate on any AC voltage, single, two or three phase

✓ DC shunt or series windings

✓ Maximum electrical safety factor

✓ Single coil in all sizes

1072

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STEARNS MAGNETS

STEARNS MAGNETIC, INC., 700 S. 28th St., Milwaukee 46, Wis.

DIRECTORY OF THE GERMAN MACHINE INDUSTRY—*Published by Hoppenstedt Wirtschaftsverlag GmbH Essen, Germany. Available from Business Publications, Box 154, Mamaroneck, N. Y. 920 pages, 7 x 10 in. Price, $12.*

This new edition of the VDMA Handbook (written in German) gives a list of VDMA members, and other detailed information about the metalworking industry of West Germany and West Berlin.

The main section of the book gives, by geographical location, detailed reports about VDMA member firms, with information about development, capital, real estate, production program, and products in which the firms specialize. Also included are labor statistics, executive officers of the firms, and similar information.

In the section grouped according to trade, the members of VDMA are listed separately according to trade group membership, such as machine tools, woodworking machines, pumps, construction machines, textile machines, and precision tools.

An up-to-date review of technical and engineering schools, describing faculties, institutes, and laboratories, has also been added.

The handbook gives an idea of the scope and nature of the German manufacturing industry, and tells where and how manufacturing industries get their equipment.

•

TECHNIQUES OF PLANT MAINTENANCE AND ENGINEERING (1954) — *Published by Clapp & Pollik, Inc, NY. 291 pages, 8½ x 11 in. Price, $7.50.*

This book, the 1954 proceedings of the Annual Plant Maintenance & Engineering Conference in New York, contains texts of papers read by 24 authors, and has direct answers to more than 1300 questions.

Added this year is a summary of 20 roundtable discussions, each of which ran for 5 hours. Separate roundtables were devoted to various industries, such as chemical plants, food processing and packaging plants, petroleum refineries, and sheet-metal plants.

The two principal subjects of this year's proceedings are "planning and Scheduling Maintenance Work," and "Maintenance Cost Control and Budgeting."

Other subjects include preventive maintenance; organization policies for effective maintenance; sanitation; work measurement; and standards and incentives.

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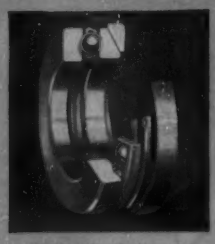

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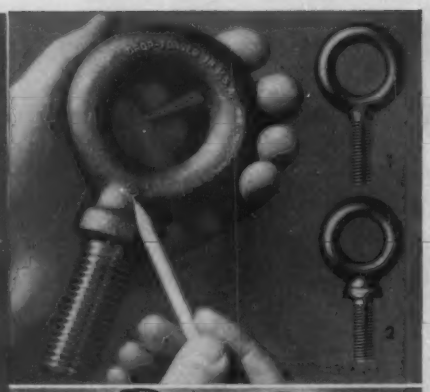

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drop-forged in plain or shoulder patterns–blank or threaded. 1. Plain—capacities from .7 to 16 tons. 2. Shoulder—capacities from .2 to 13 tons.

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ILLUSTRATED: 10" x 3' bed Underneath Motor Drive Bench Lathe, priced at $1208 f.o.b. factory, less electrical equipment. Time payment terms available — ten percent down and 12 or 18 monthly payments.

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Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941
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WAGES UP 150%
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Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

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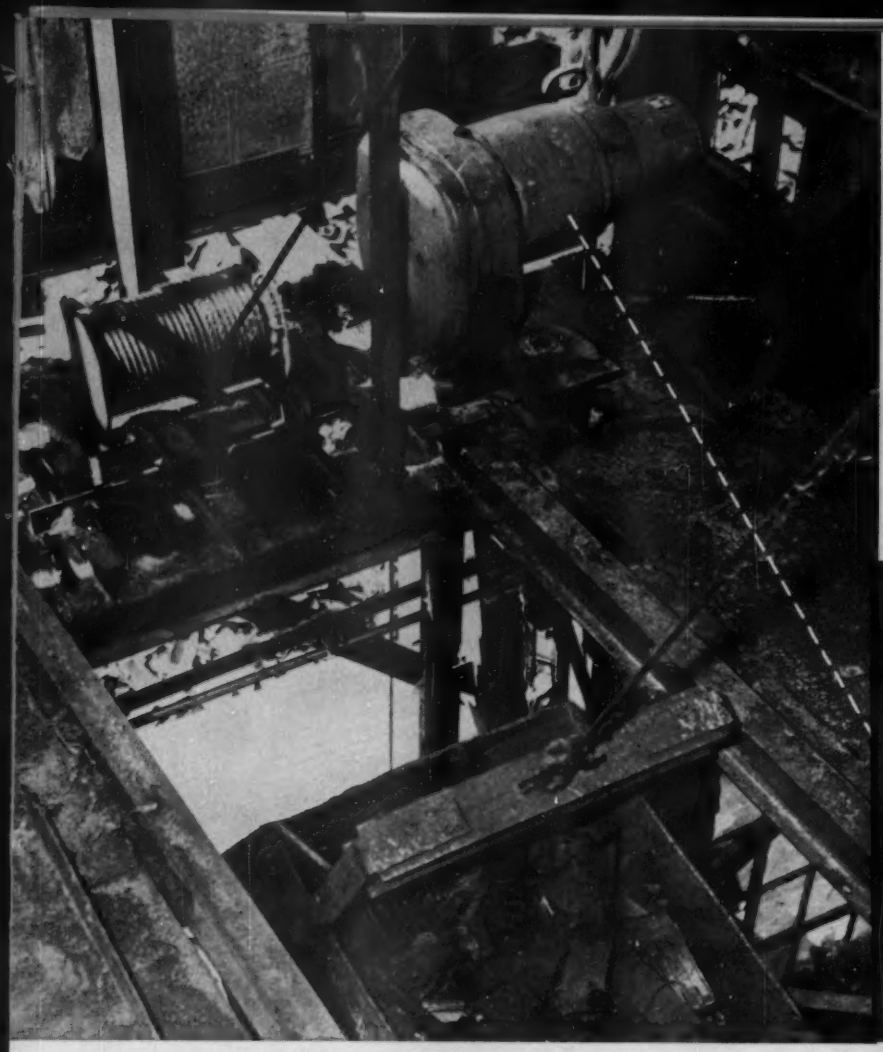
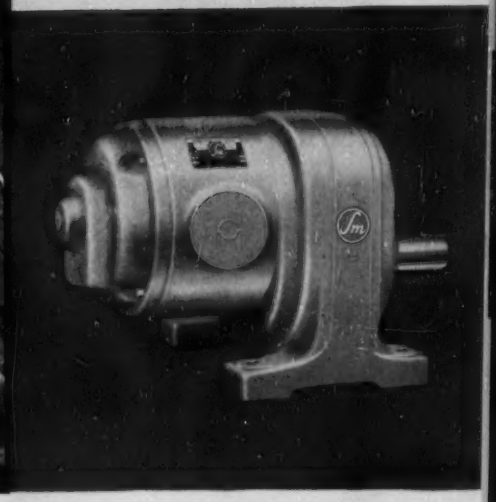
SOUTH BEND LATHES



STANDARD BRAKE SHOE CHOOSES SLO-SPEEDS FOR RUGGED SERVICE

The power drive on our cupola charger has to take a lot of punishment, reports Mr. J. R. Karlovic, Plant Supt. for Standard Brake Shoe and Foundry Co., Memphis... and Slo-Speed with motor mounted brake gives us the dependable, trouble-free service we must have for day-in, day-out operation, carrying a load of 2500 lbs. and making 25 round trips per hour to keep our cupola charged with metal, coke and limestone.



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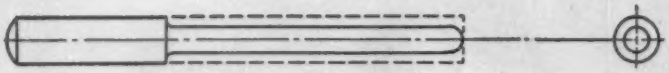
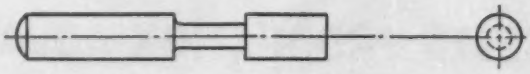
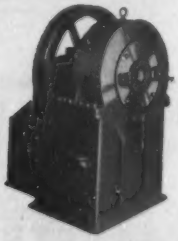


This finished piece used to be made on an automatic screw machine with the long, narrow diameter section turned to .100 ±.003 and a necessary sharp shoulder.



Torrington's swaging experts suggested starting with this simple screw machine blank (to retain the required shoulder).

Result after one rotary swage—an improved finished piece, to a tolerance of ±.001.



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Makers of Torrington Needle Bearings

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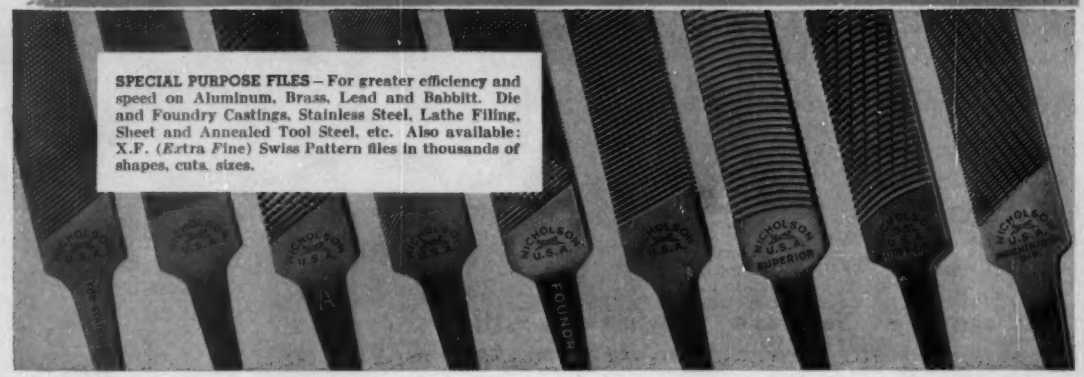
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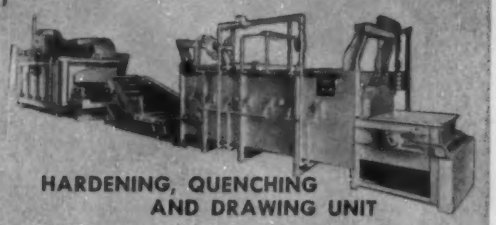

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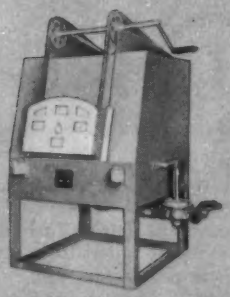

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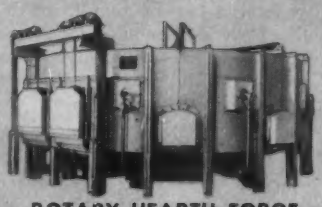

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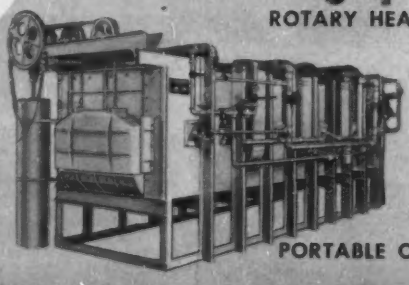

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	0	250	500	750	1000
QDB .4	.42	.40	.38	.35	.31
QDB .75	.84	.80	.78	.73	.66
QDB 1.5	1.67	1.62	1.57	1.50	1.42

Selection Data

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	0	250	500	750	1000
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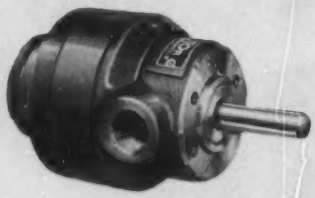
QDB .75	.13	.27	.41	.56	.71
QDB 1.5	.16	.42	.70	1.00	1.28

PRESSURE—Maximum continuous operating pressure is 1000 p.s.i.

SPEED—Standard design speed is 1800 r.p.m. Specific recommendations are made for applications at other speeds.

ROTATION—Standard rotation is clockwise facing shaft end. Counter-clockwise rotation is available.

OIL—Hydraulic oils with viscosity of approximately 300 s.s.u. at 100° F. are recommended.



TYPE QDH

The QDH . . . popular intermediate size of the Gerotor line

DELIVERY — G.P.M. AT 1200 R.P.M.							
TYPE	DISCHARGE PRESSURE P.S.I.						
	0	250	500	750	1000	1200	1500
QDH 3	3.3	3.2	3.1	3.0	2.9	2.7	2.5
QDH 5	5.6	5.4	5.3	5.2	5.1	4.8	4.4
QDH 8	8.6	8.5	8.4	8.3	8.2	8.1	7.8
QDH 12	12.9	12.8	12.7	12.5	12.3	12.2	11.8

Selection Data

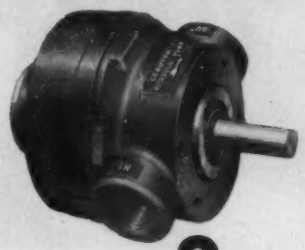
HORSEPOWER REQUIRED AT 1200 R.P.M.							
TYPE	DISCHARGE PRESSURE P.S.I.						
	0	250	500	750	1000	1200	1500
QDH 3	.25	.7	1.2	1.6	2.1	2.5	3.4
QDH 5	.33	1.1	1.8	2.5	3.2	3.7	4.6
QDH 8	.4	1.5	2.7	4.2	5.4	6.3	7.9
QDH 12	.5	2.3	4.2	6.1	8.0	9.6	11.7

PRESSURE—Maximum continuous operating pressure is 1200 p.s.i., maximum intermittent 1500 p.s.i.

SPEED—Standard design speed is 1200 r.p.m. Specific recommendations are made for applications at other speeds.

ROTATION—Standard rotation is clockwise facing shaft end. Counter-clockwise rotation is also available.

OIL—Hydraulic oils with viscosity of approximately 300 s.s.u. at 100° F. are recommended.



TYPE O

Gerotor Series O . . . when larger capacities are needed

DELIVERY — G.P.M. AT 1200 R.P.M.					
TYPE	DISCHARGE PRESSURE P.S.I.				
	0	250	500	750	1000
O-20	20.0	19.5	18.8	18.0	17.2
O-25	25.0	24.5	24.0	23.2	22.2
O-30	31.2	31.0	30.5	29.8	29.0
O-40	43.0	42.5	42.0	41.5	40.0

Selection Data

HORSEPOWER REQUIRED AT 1200 R.P.M.					
TYPE	DISCHARGE PRESSURE P.S.I.				
	0	250	500	750	1000
O-20	1.0	4.0	7.2	10.5	13.5
O-25	1.5	5.0	8.6	12.0	15.6
O-30	2.0	6.5	10.9	15.5	19.5
O-40	3.0	9.0	15.0	21.0	27.5

PRESSURE—Maximum continuous operating pressure is 1000 p.s.i., except type O-40, which is recommended for only intermittent duty at 1000 p.s.i.

SPEED—Standard design speed is 1200 r.p.m. Specific recommendations are made for applications at other speeds.

ROTATION—Standard rotation is clockwise facing shaft end. Counter-clockwise rotation is available.

OIL—Hydraulic oils with viscosity of approximately 300 s.s.u. at 100° F. are recommended.

Whatever your needs in hydraulic pumps . . . consult the GEROTOR engineers. Write for FREE literature and information, no obligation, of course.

GEROTOR MAY CORPORATION
P. O. Box 86—Baltimore 3, Maryland

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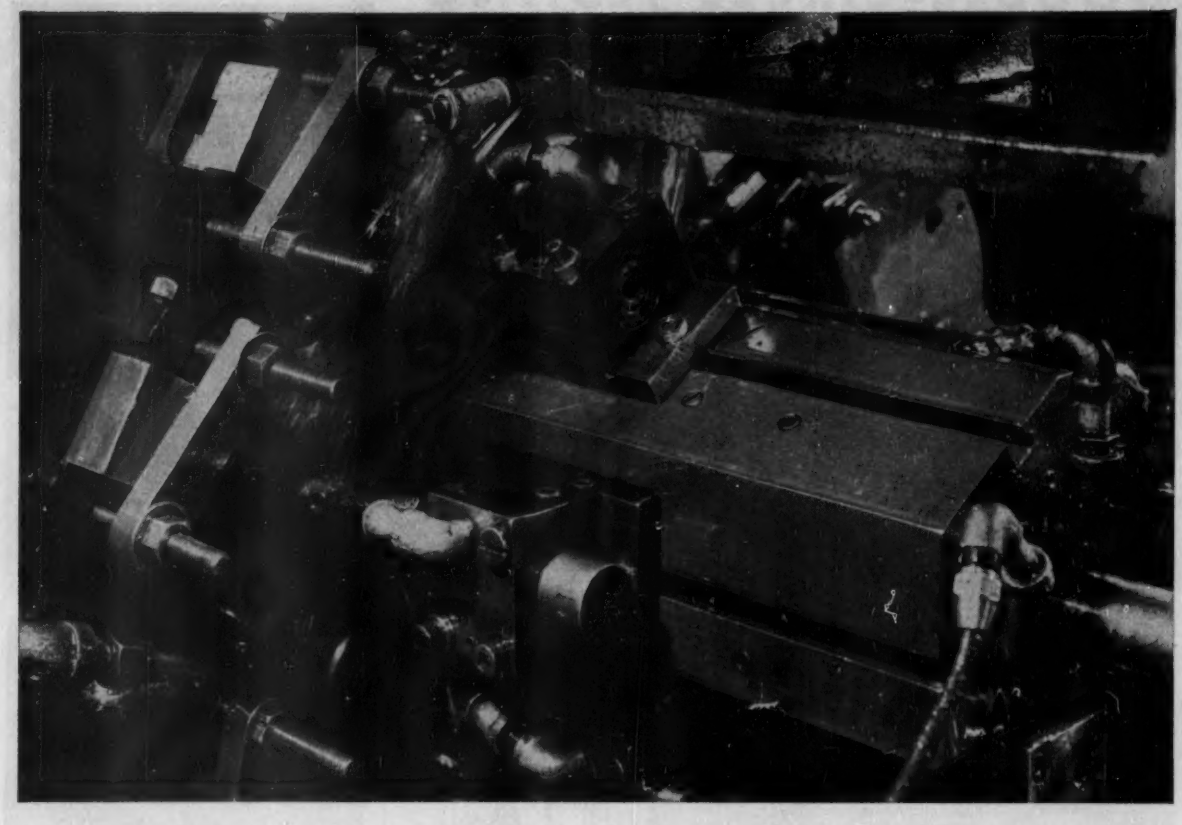
HYDRAULIC PUMPS — HYDRAULIC MOTORS

Pneumatic Bin Evacuators — Precision Contract Manufacturing



Are your automatics turning out what they could?

Let's say you've checked the machine itself. The tools. The setup. The feeds and speeds. And you find them O.K.

You may still be missing your peak production because of the steel you're using.

Many manufacturers have found that switching to Republic Cold Drawn Alloy Steels has given them the qualities they want in steel parts. And it's also given them the cost-cutting advantages that are built into high-speed automatics. Here's how it works.

Designers can make full use of Republic Cold Drawn Alloy Steel's high strength and uniform structure. Production men get the ideal combination of wear-ability and strength from the uniform hardenability and toughness of alloy steel.

And you get uniform machinability as well.

Republic's 3-D Metallurgical Service is ready to help you get the best out of Republic Cold Drawn Alloy Bars. A phone call to your nearest Republic District office may uncover the answers to some of your tough cost and production problems.

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Union Drawn Steel Division • *Massillon, Ohio*
GENERAL OFFICES • **CLEVELAND 1, OHIO**
Export Department: Chrysler Building, New York 17, New York

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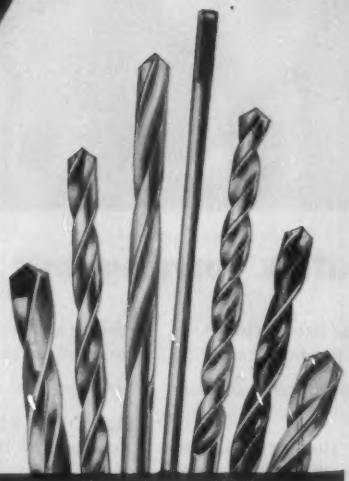
assures longer life... more cutting mileage!

● Careful testing at Chicago-Latrobe gives accurate appraisal of the number of holes a DOUBLE-CIRCLE Drill will cut before sharpening becomes necessary. Constant effort by Chicago-Latrobe engineers steadily increases performance. High standards of quality and careful inspection of every manufacturing operation is maintained to meet close tolerance specifications . . . to give you LONGER CUTTING MILEAGE . . . and less shut-down time.

A variety of types and sizes of DOUBLE-CIRCLE Drills meet every requirement . . . General Purpose . . . Heavy Duty . . . Fast Spiral . . . Slow Spiral . . . Bright Spiral . . . Carbide Tipped and Specials. Write for booklet No. 179 for description.



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DOUBLE CIRCLE TOOLS

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DRILLS • REAMERS • COUNTERSINKS • COUNTERBORES • CARBIDE TOOLS • SPECIAL TOOLS

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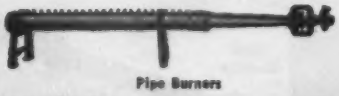
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RING ★ PIPE ★ NOZZLE

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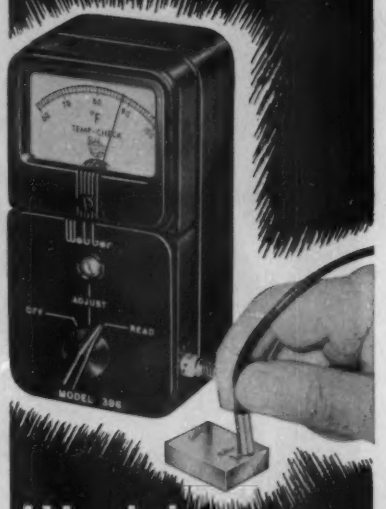
Don't let extremes of temperature affect accuracy



Webber TEMP-CHECK INSURES accuracy

TEMP-CHECK eliminates time lost while waiting for blocks or work to cool before checking dimensions.

Simply place TEMP-CHECK probe on the metal to be inspected and its actual temperature will be quickly indicated on scale.

TEMP-CHECK is a wonderful time saver. It takes temperature differentials into account and a quick calculation gives you exact dimensions.

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"BRINGS THE WASHROOM TO THE WORKER"

SUGAR BEET PRODUCTS CO., SAGINAW, MICH.

American industry has a "new look" . . . along production lines . . . in critical trouble spots . . . wherever hard-to-remove industrial soils exist . . . you'll see SBS Waterless Washstations using famous SBS-30 Waterless Skin Cleanser. Proved by 6 years industrial usage, SBS-30 is unchallenged in its ability to SAFELY remove embedded grease, grime, paint, asphalt and most other stubborn soils — WITHOUT WATER.

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SEND details on the new SBS Waterless Washstation.

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NOW Clutch Operated Models

extend the applications for

Swanson TURRET INDEXING UNITS

Swanson Series TC Unit shown with optional mounting brackets.

By providing a "packaged" intermittent-motion chassis, Swanson Turret Indexing Units save time and money in designing and building special automatic machines for precision production operations on small and medium parts.

SWANSON series TC indexing turrets differ basically from the accepted series T units only in the solenoid-operated clutch drive provided. They incorporate the same Swanson cross-over cam and locking device to assure harmonious indexing and accurate, positioning at all work stations. They are available in a wide range of turret diameters and work stations, with full provision for mounting operational devices of all types.

The new clutch-operated models have been developed to handle applications requiring a high variable of infinite work cycles . . . or where it is desirable to have the operator control the indexing cycles by push-button controls. Limit switches may also be provided to prevent indexing before completion of any operation cycle. Without obligation, Swanson engineers will be glad to suggest applications of these units and accessories to you. In over a third of a century, Swanson-made machines have improved quality and quantity in hundreds of manufacturing operations.

Write for Bulletin TC1

. . . Some other PRECISION PRODUCTS by SWANSON

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- **Major load removed by motor**
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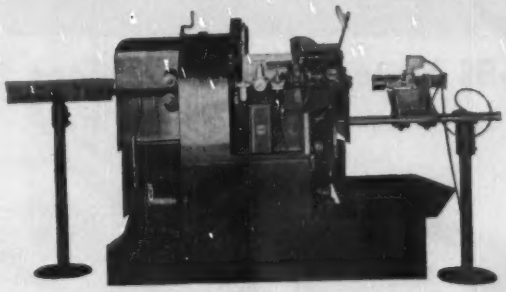
plus BRALES and TUKON

MODERN CUTTING-OFF MACHINE



Cuts off longer pieces than regular automatic machine—*any length you want.* FAST cutting and chamfering of tubing, pipe, shafting. Check the following figures:

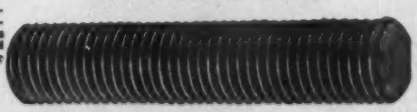
½" Tubing
Cuts and Chamfers both outside edges of ½" .030 wall tubing, 5" lengths, every 2.5 seconds.

1¼" Cold Rolled
Cuts and Chamfers both ends, 20" long, at rate of 1 every 20 seconds.

1" Tubing
Cuts and Chamfers both outside edges, pieces 3" long. One every 3 seconds.

4" THREADED STUDS

Modern Automatic Cutting-Off Machines available in 4 sizes, handling work up to 6¾ O.D.



WRITE FOR CATALOG

Cut and chamfered at one time—in 9 sec.—from 10 ft. length of stock already threaded (¾" U. S. Standard). Clean cut. Clean chamfer. Nuts start easily, with no extra finishing required.

MODERN MACHINE TOOL CO.

2005 LOSEY ST. JACKSON, MICHIGAN

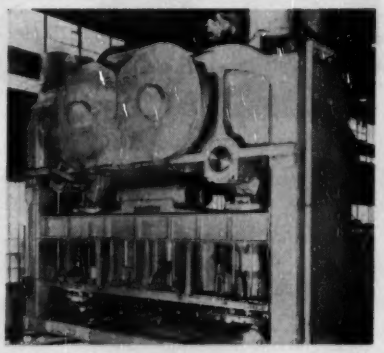
LARGEST MECHANICAL PRESS EVER BUILT

New Hamilton 4000 ton capacity press, in which there is no relative deflection in bed and slide, forms side rails that are perfectly straight

This Hamilton Side Rail Press was placed in production last winter in the Cleveland Plant of Midland Steel Products Company. It is an enormous machine, weighing 900 tons, which in itself is newsworthy. However, the outstanding feature is its ability, when loaded to 4000 tons pressure (its nominal capacity) to form perfectly straight side rails, without camber or "bow." This eliminates the subsequent straightening operation which has been the accepted customary practice in chassis frame manufacture.

OTHER "HIGHLIGHTS" OF THIS 4000 TON HAMILTON PRESS

- The bed is equipped with six 42-inch diameter air cushions providing 415 tons pad-pressure with air at 100 psi.
- The cushions are linked together and the operating valves are controlled by one pilot valve so that the six cushions function as a unit at all times.
- Overall height 44 feet with topmost point 30 feet above floor.
- 320 inch clear space between the uprights and gibs; shut height on bed 40 inches.
- Stroke of slide 22 inches; adjustment 12 inches.
- Drive motor 150 hp; slide adjusting motor 25 hp.



NEW HAMILTON PRESS at Midland Steel Products Company, Cleveland, Ohio is shown at top forming perfectly straight 22 ft. side rails of ⅜-in. steel without camber or "bow."

HAMILTON PRESS DIVISION
Baldwin-Lima-Hamilton Corporation
Curtis Building
Detroit 2, Michigan

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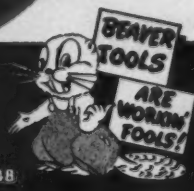
No matter what your tool requirements may be — no matter how often tools must be changed—Beaver Quick-Change Tool Holders and Adaptors will save you money.

Beaver's versatile Quick-Change Tooling permits the use of shell mills, face mills, end mills, drills, reamers, boring bars and other desired tools on any Beaver equipped machine without loss of accuracy.

Less than ten seconds per tool change gives you maximum production from each machine. Down-time reduced to an unbelievable minimum.

Beaver Quick-Change Tooling can be installed on most standard machines. Let us show you how it will benefit YOUR machine operations.

Write for our complete catalog #52.



Beaver TOOL AND ENGINEERING CORPORATION

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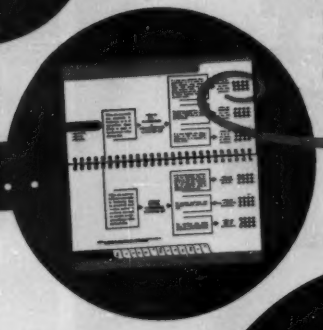
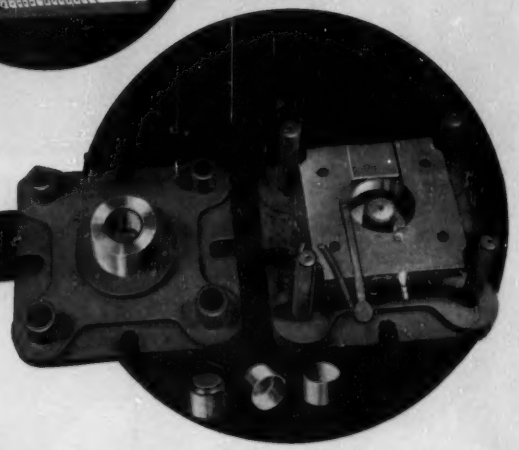
How ONE TOOLMAKER . . .

USED THIS GUIDE . . . . . —then use HAMPDEN (Oil-Wear) or No. 610 (Air-Wear)



TO HOLD DOWN UNIT COSTS . . .



AT which step in your tooling process would you welcome real help in reducing tool and die costs? Tool Steel Selection? Heat Treating?—or on-the-job "Trouble-Shooting"? Here's how you, like the maker of the Dies shown here, can start to reduce costs with a Method that helps you at *all 3* steps.

First, to simplify selection, use the handy Selector Section in the Carpenter Matched Tool Steel Manual. Quickly and surely, it enables you to put your finger on the proper steel for best results. Next, to further insure tool and die performance, use the Manual's complete heat treating instructions—they have been simplified beyond anything previously known. It's easy to get started—use the Carpenter Matched Set Method to help you "trouble-shoot" your present tool and die jobs.

For better, lower-cost tooling, put this practical, easy-to-use Method to work, now. Ask for the 189-page Carpenter Matched Tool Steel Manual—just see your Carpenter representative. The Carpenter Steel Company, 109 W. Bern Street, Reading, Pa.

Job:
Compound Blank and Draw Die for forming .031", ¼-hard brass Vent Valve Bodies at the rate of 103 per minute on a punch press.

Problem:
Unit costs were on the upswing because the old dies wore too rapidly, causing frequent and costly machine shutdowns for regrinding.

Solution:
Looking for a die steel with maximum wear resistance, the toolmaker referred to the Selector Section in the Carpenter Matched Tool Steel Manual, and quickly arrived at Carpenter *Hampden* (Oil-Wear).

Heat Treatment:
Simplified instructions in the Manual were followed.

Results:
2 hours of costly machine downtime were eliminated *each day*—production per grind *rose over 300%!* As a matter of interest, the toolmaker takes off approximately .0005" per stoning and gets about 100 grinds from the Blank and Draw Die.

IMMEDIATE DELIVERY FROM LOCAL STOCKS!

Call Your Nearest Carpenter Warehouse or Distributor

Carpenter STEEL

Matched Tool and Die Steels

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

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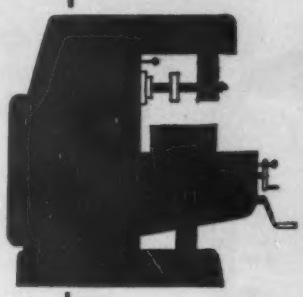

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No tools like the right tools! Columbus Die-Tool designs and builds tools, jigs, fixtures and special machinery to meet your most exacting requirements. RESULTS: operating cost that matches your budget; production that matches your schedule; product quality that matches the demands of your market.

Contact Columbus Die-Tool & Machine Co. first—when you have a special machine problem. They are nationally known as expert designers and builders of special machinery and equipment . . . have been for over 46 years.

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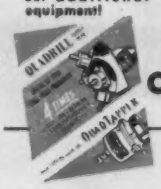
one drill press does the work of FOUR

Send NOW for additional information on how YOU can increase YOUR production without additional equipment!

Drill — ream — countersink and counterbore, all on one drill press without setting up for each operation. A simple rotation of this turret head brings any one of four drills or cutting tools into position. Accurate — fast — economical! Try Quadrill — it will earn you more profit thru less production cost.



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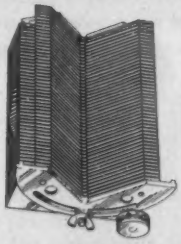

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Throat, 4" deep.
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Test head removable for testing large parts—castings, forgings, etc.
Equally accurate as portable or stationary equipment.
Can be used in any position—even upside down.

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How Reynolds Aluminum Screw Machine Stock Can Help You Get The Order Time After Time

Here's a new "trick of the trade" you can use to get valuable new business. It's a brand new way to close more sales—a way to get *your* quotation accepted—and a way to beat out your competition!

When your customers specify other materials give them an *alternate* quotation *based on aluminum*. The figures will astonish you, for aluminum gives you three times as many pieces per pound!

Up Goes Production. Down Go Your Costs. Strong, lightweight aluminum offers the very lowest unit costs for material, machining, handling and shipping.

SCREW MACHINE ALLOYS

11S-T3—Free machining. Fine finishes at high speed. Free cutting, fine chips, good strength. Excellent for screw machine work. Longer tool life but slightly less strength than 17S-T4. Good formability of machined parts.

17S-T4—Excellent finishes. Fine for general purpose machining. Good corrosion resistance and strength.

Greater speeds and feeds are possible with aluminum alloys. They are easier on tools, but sometimes minor tool modifications are required.

SPECIAL MACHINING ALLOYS

24S-T4—For simple machine work. Chips long and curled. Stronger than preceding alloys. Smooth finishes.

61S-T6—Good corrosion resistance, weldability, strength. Lower machinability. Best formability and suited to electro-chemical finishes.

2S and 52S—Higher purity aluminum alloys available for special applications. Have good formability.

Finishing is not required because aluminum is rust free. When desired, it takes all standard finishes in addition to many beautiful, anodized colors.

Find Out About this New Way to Get Your Quotations Accepted. Call the Reynolds Office or Distributor listed under "Aluminum" in your classified telephone directory.

Write for FREE Book. Write on business letterhead for your copy of the 124 page handbook, "Machining Aluminum Alloys". Reynolds Metals Company, 2523 South Third St., Louisville 1, Kentucky.

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Bridgeport Brass Co., (Wire, Rod, Bar) Cleveland
Kaole Steel Corporation, Cleveland
Mutual Manufacturing & Supply Co., Cincinnati
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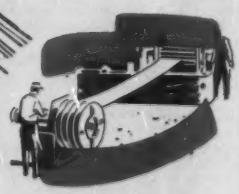

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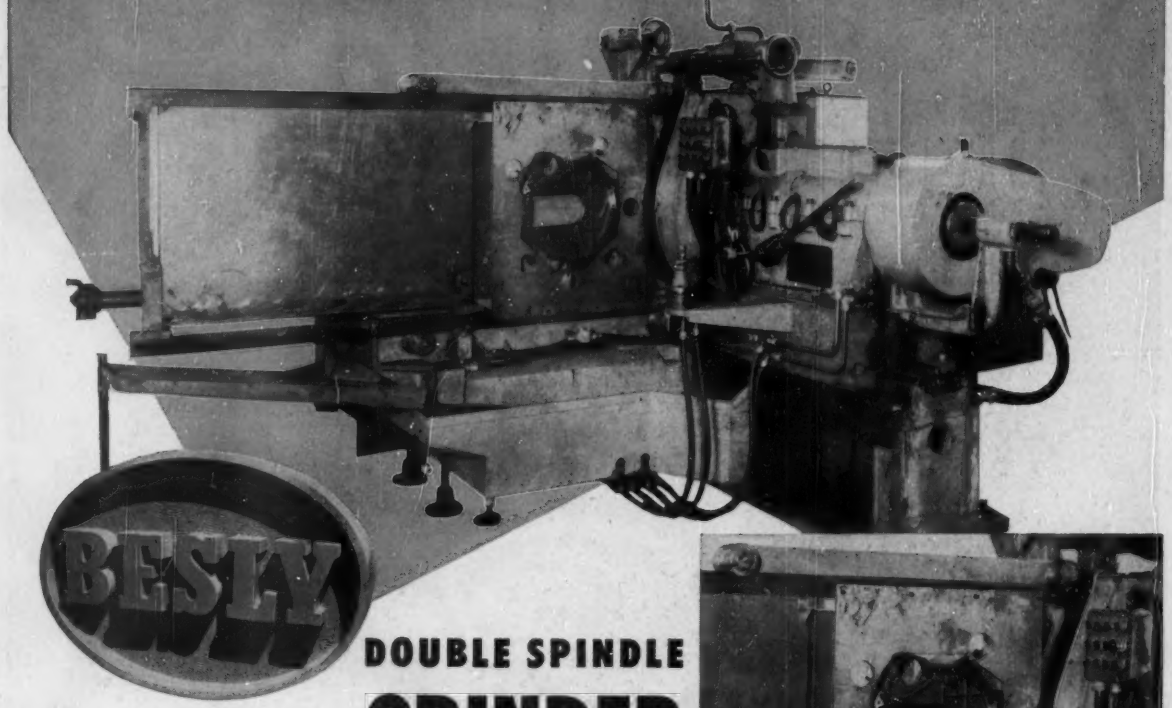
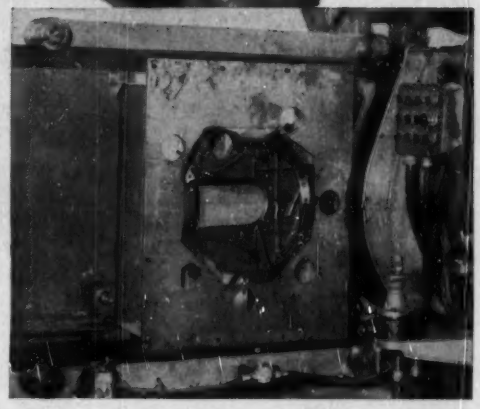


DOUBLE SPINDLE GRINDER



At a production rate of one a minute, this specially designed Model 226-30″ Double Spindle Besly grinds *both sides of torque converter plates at the same time.* With stock removal of .020″, accuracy is .003″ for parallelism and .006″ for size.

This is another example of how Besly grinders are paying off—in this case in higher production for a leading automobile manufacturer. Besly's success in matching the right machine design and the right abrasive to each of many different grinding operations and metals, including the hardest of alloys, is due to over fifty years experience in the grinding field. Our engineers are at your service.

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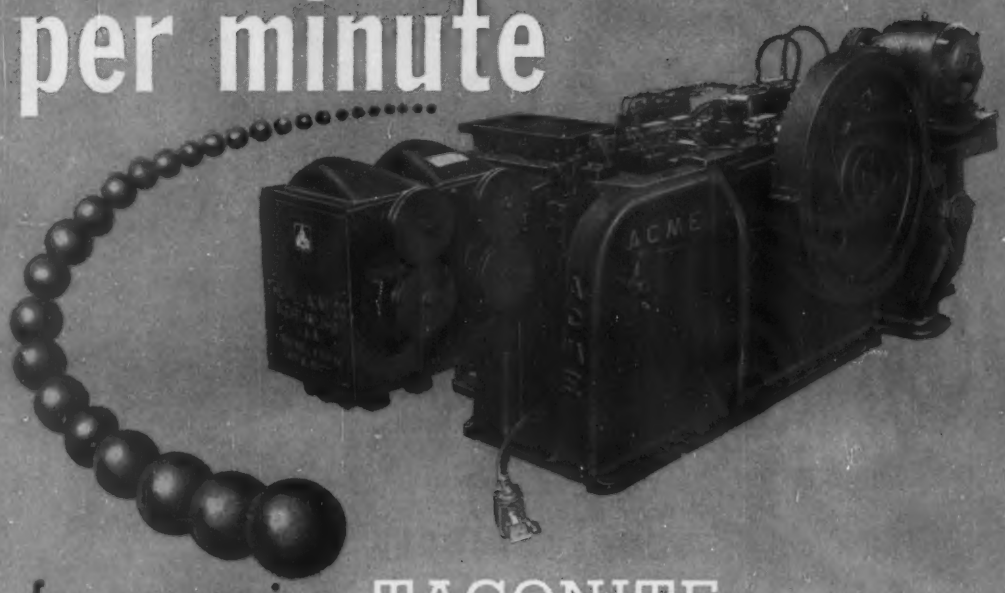

for processing TACONITE

The tremendous possibilities presented to the steel industry through the processing of low grade iron ore (TACONITE) has resulted in unusual interest in methods for the production of steel balls by hot forging. Illustrated here is an ACME 1" Ball Forging Machine for the continuous production of hot forged hard steel balls from ½" up to and including 1", made from stock diameters smaller than the nominal size of ball.

Operated by one man, this ACME Forging Machine automatically feeds bar stock through the feed rolls at the proper speed for maximum efficient operation of the machine, producing 135 balls per minute, with adequate safety devices to prevent jamming of the die.

Complete information is available for all those interested in the details of this special purpose ACME Forging Machine. Made in 1" and 2" capacities.

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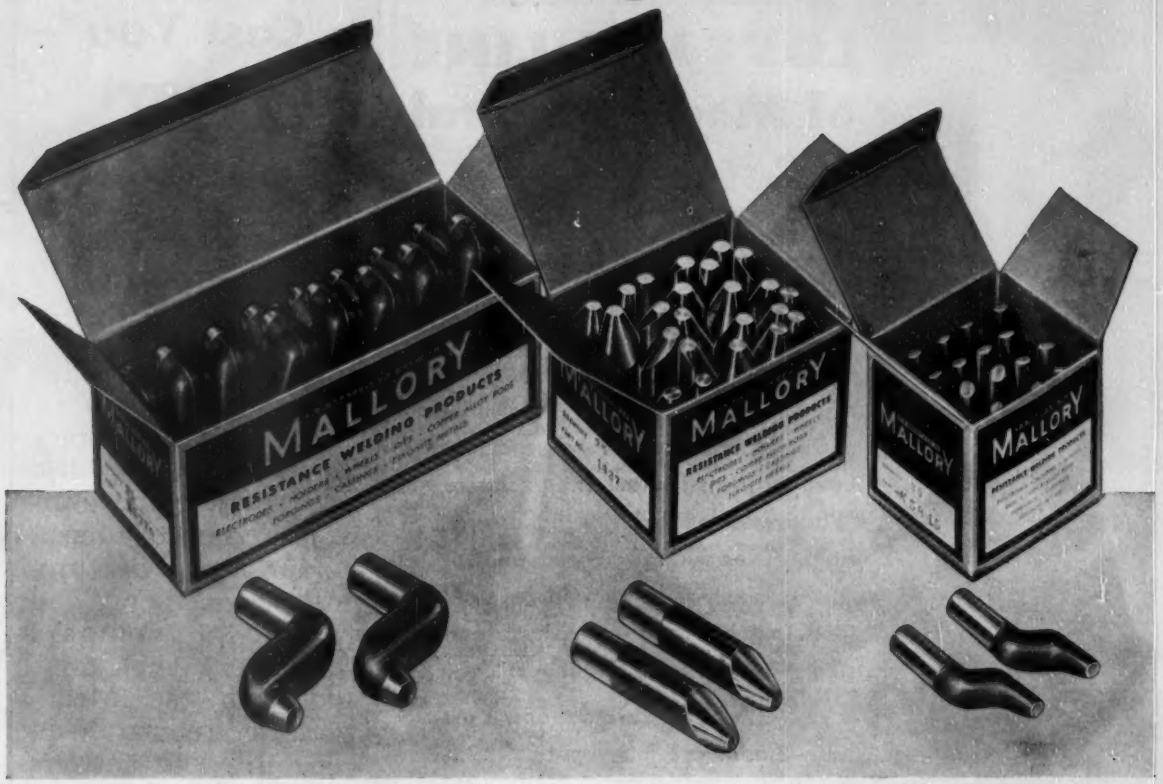

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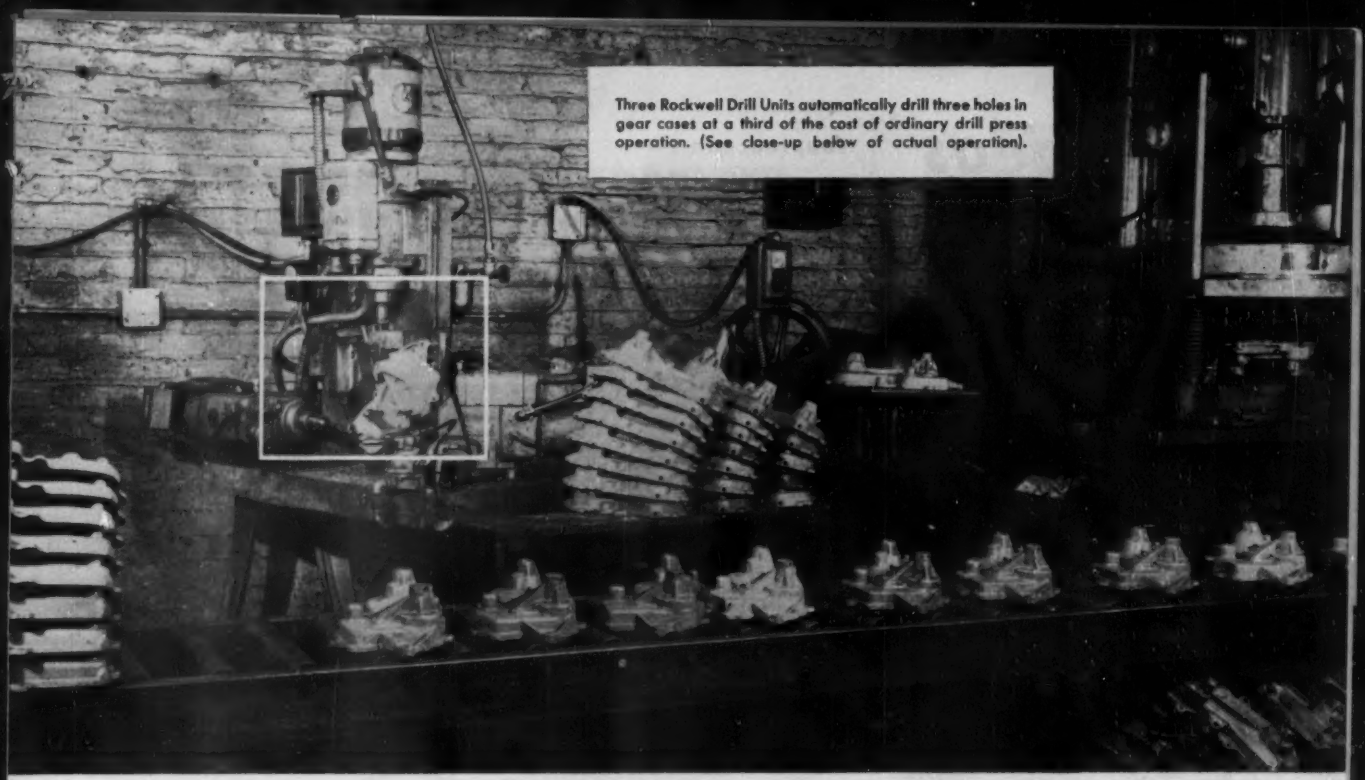


Three Rockwell Drill Units automatically drill three holes in gear cases at a third of the cost of ordinary drill press operation. (See close-up below of actual operation).

How Woodruff and Edwards Cut Cost 61.77% On Gear Case Machining Operation With Rockwell* Drill Units

Before tooling up to machine gear cases that were to be produced under contract *for the Whirlpool Corporation, Woodruff and Edwards, Inc.* (Elgin, Illinois, foundry and production jobbing firm) conducted comparative cost studies of conventional drill presses versus Rockwell Air-Hydraulic Drill Units. The operation involved drilling three holes at various angles into the gear case. It was determined that these operations performed on drill presses would require 1.04 minutes, at a cost of $.0936 per part.

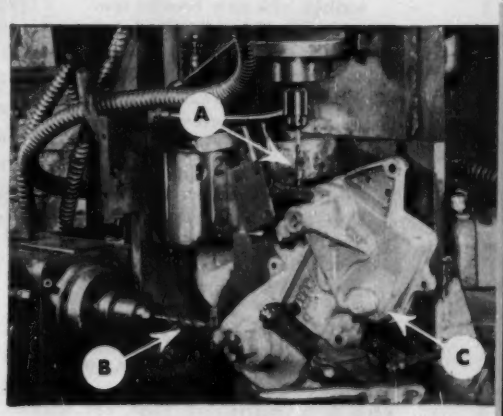
On the basis of this cost study, Woodruff and Edwards installed three Rockwell Drill Units on a simple weldment, around an inexpensive holding fixture. With this shop built machine, they do the job in 0.4 minutes floor to floor time, at a cost of $.036 per part—a saving of 61.77%.

Richard W. Hampel, Superintendent of Woodruff and Edwards' Manufacturing Division, points out: "They could do even better if we'd let them. Our Rockwell Drill Units operate at the station following the automatic boring machine, and output is limited by the boring machine's cycle time.

"Our Drill Unit machine is operated by the boring machine operator on idle time, giving us practically a free operation." This is one of the advantages of remote-automatic operation.

Rockwell Drill Units are available for plant demonstration through Rockwell Sales Engineers, who are also equipped to offer engineering aid in conducting cost studies on operations involving production drilling, tapping, counter-boring and similar operations.

Full information is available by writing to: Drill Unit Division, Rockwell Manufacturing Company, 304H North Lexington Avenue, Pittsburgh 8, Pa.



Triggered by the air clamp that secures the gear boxes, the Rockwell Drill Unit machine: (a) drills a 3/32" hole at a 45° angle through the underside of the casting; (b) drills a 7/32" hole vertically through a 1½" boss; and (c) with a Letter "R" drill, drills an oil plughole. All three units retract independently.

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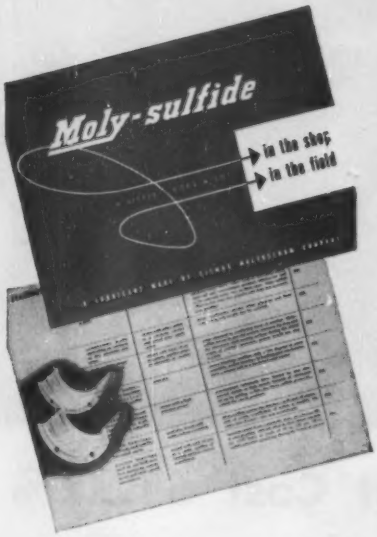

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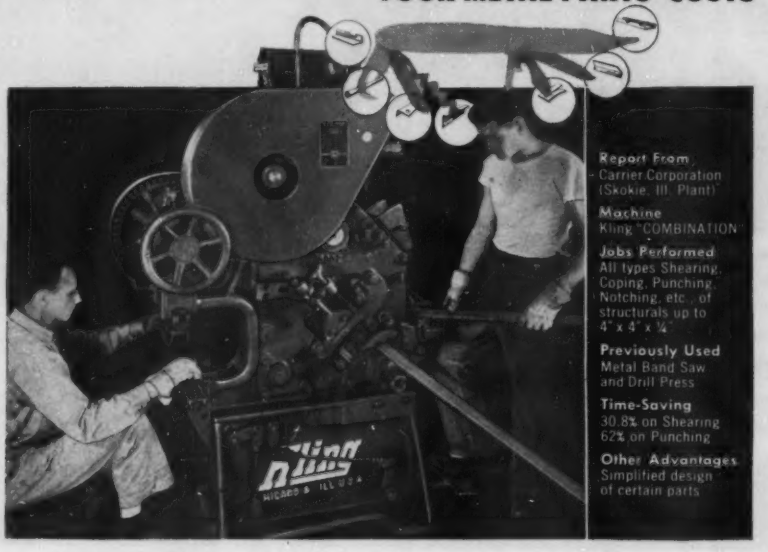

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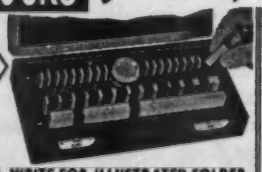

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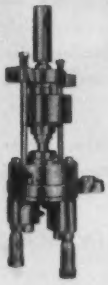

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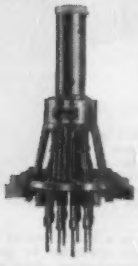

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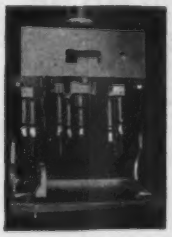

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Shown is a ten spindle multiple drilling head, drilling ten varied size holes on different elevations.

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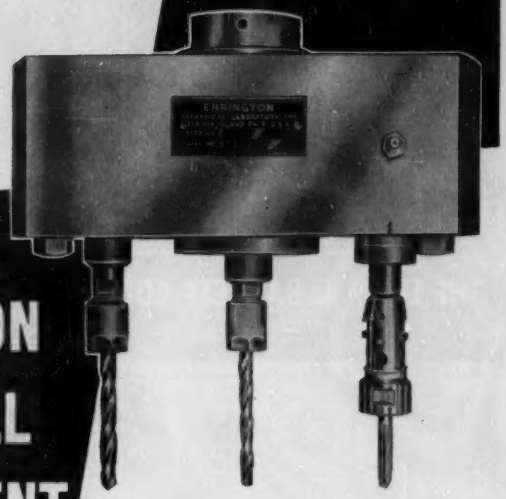

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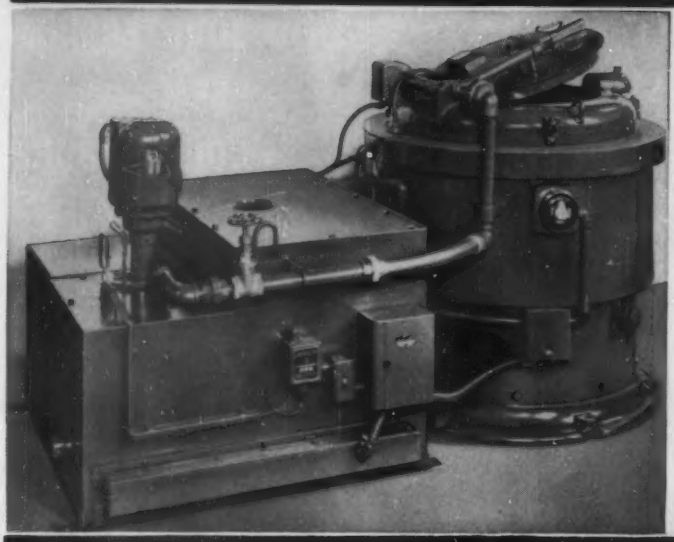

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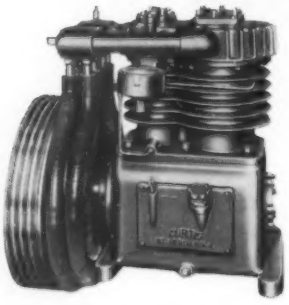

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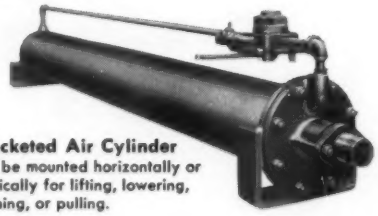

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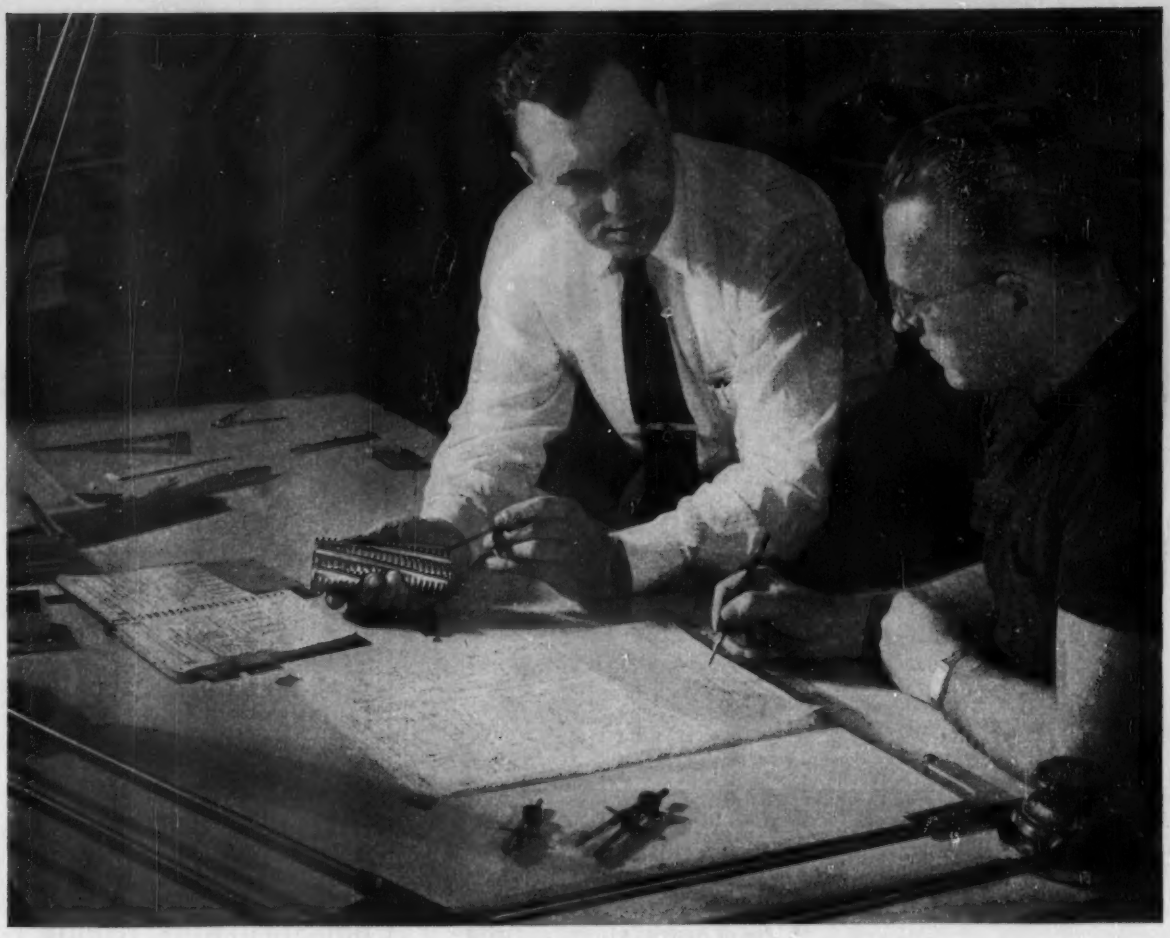

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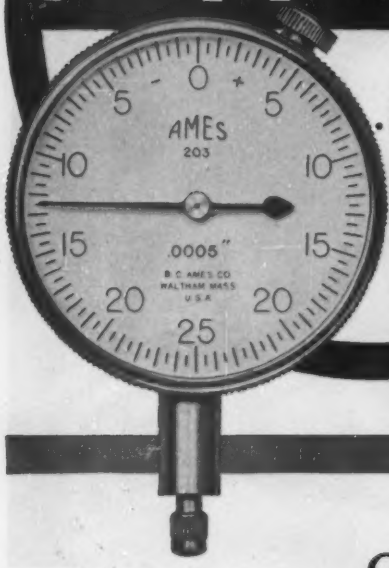

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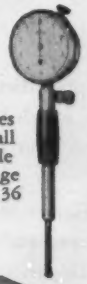

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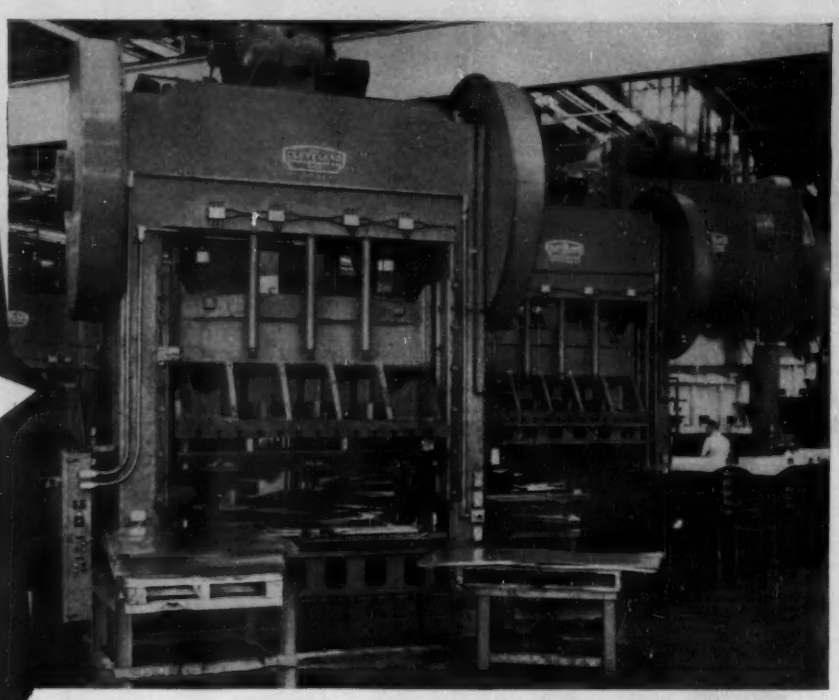

Photos courtesy General Electric Company.

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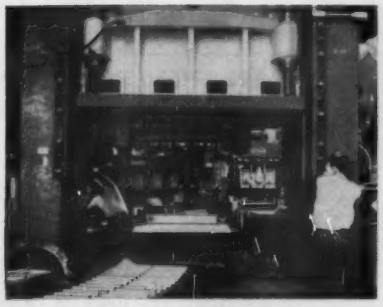

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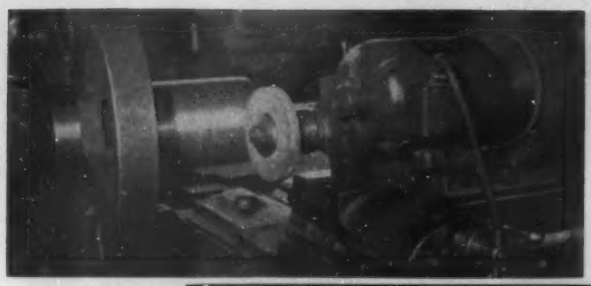

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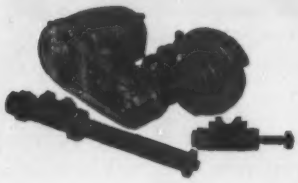

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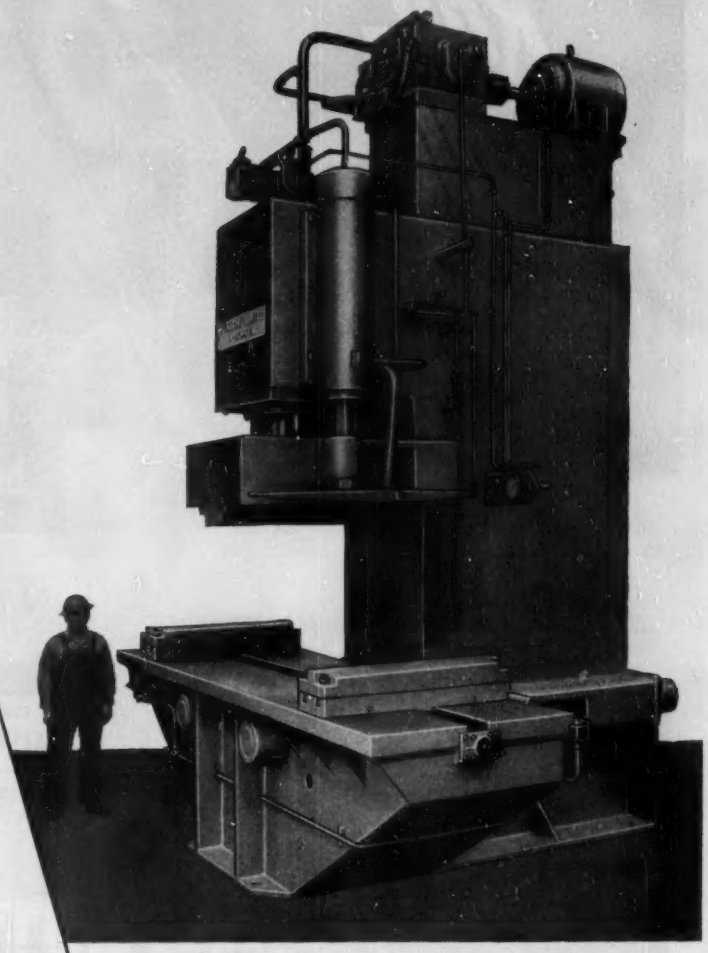

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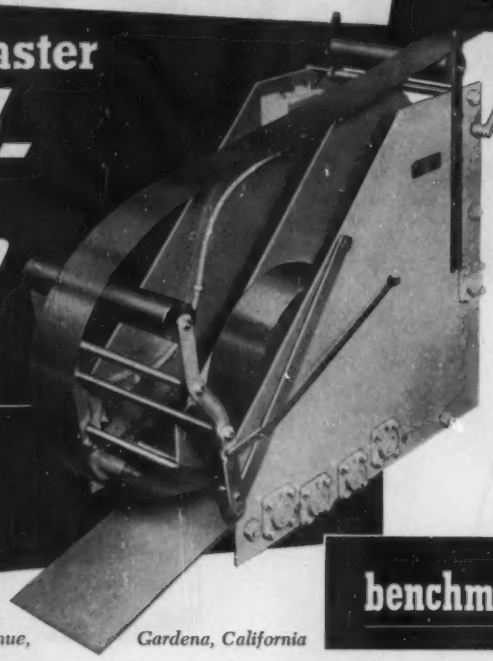

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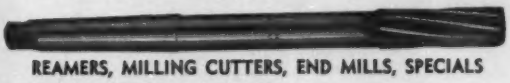

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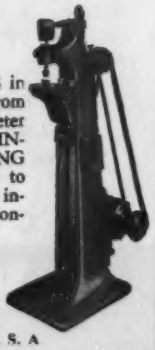

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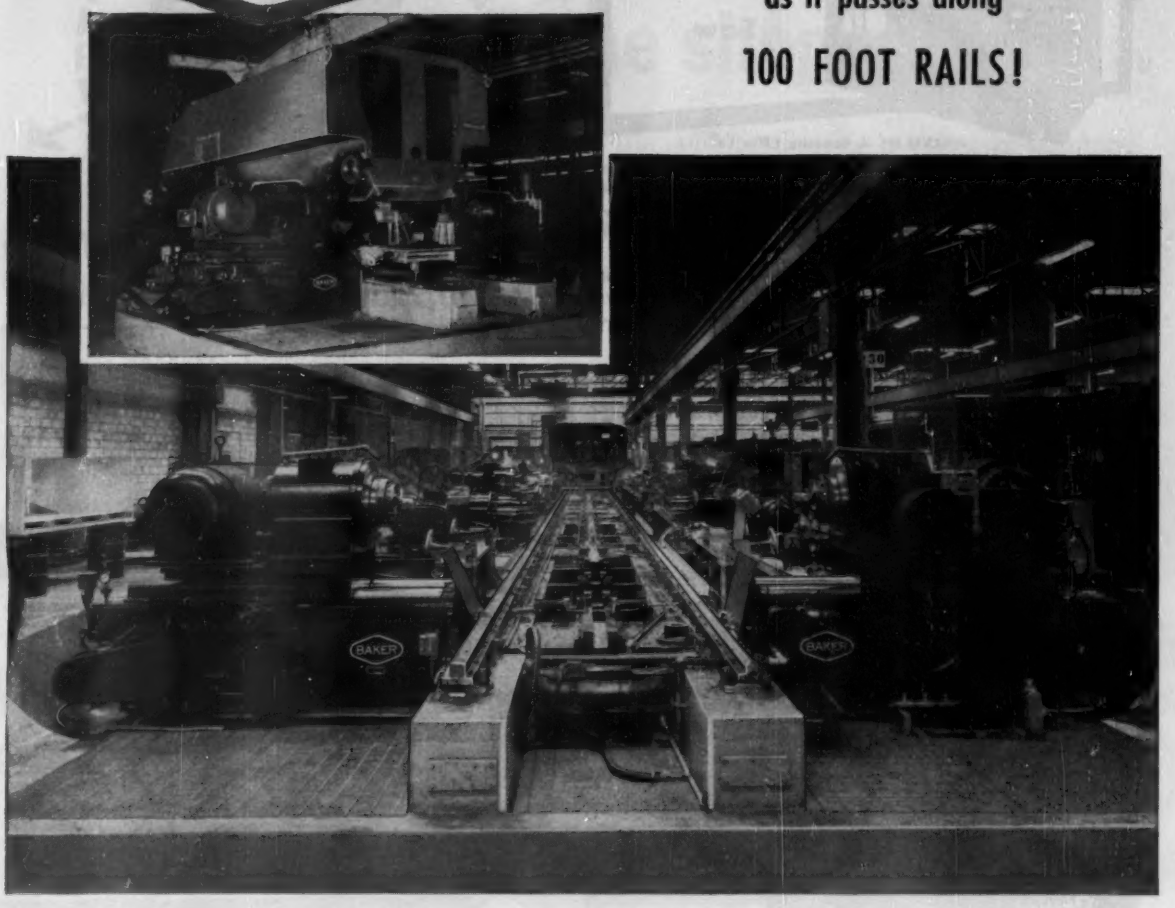

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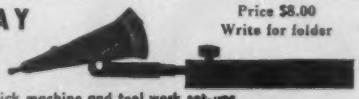

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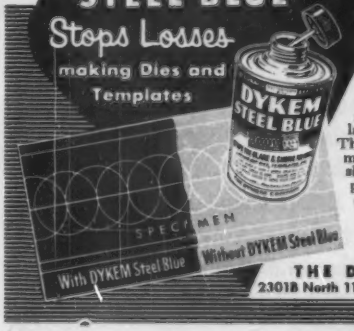

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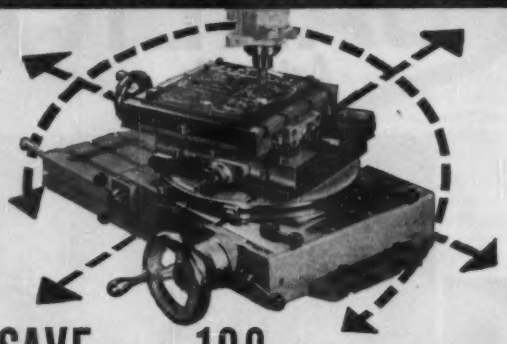

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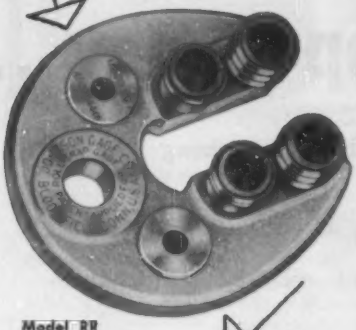

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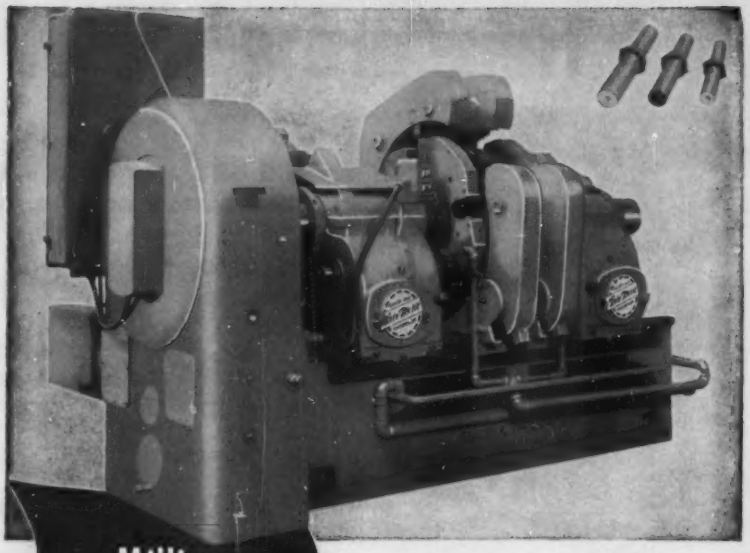

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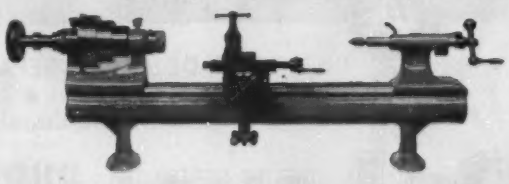

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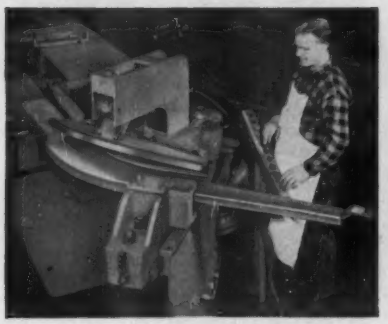
HOW 6 MAJOR INDUSTRIES NOW CUT *Product Costs*

1 AIRCRAFT TUBING—Smooth, extra sharp bends now produced in ultra-thin stainless steel tubing, saves space and $14,000 per plane for aircraft manufacturer. Shown above, Pines Size 4 Unit forming wrinkle-free 8" c/l radius bend in 4" x .020" S. S. tubing.



2 HOLLOW TRACTOR BOOMS—Cold bending 12 ga. welded steel tapered tubes without distortion on Size 4 Pines unit eliminates expensive blanking and forming dies, saves tons of material for farm equipment manufacturer.

3 EXTRUDED WINDOW FRAMES — Part of production line setup in large aluminum fabricating plant, this small Pines Semi-Automatic saves space, accurately bends automobile window frame moldings.

4 REFRIGERATION AIR CONDITIONING ELLS — Special Pines Automatic Cut-Off Benders now produce copper ells and return bends at speeds up to 1500 per hour, reduces scrap losses to 1%.

with PINES PRODUCTION BENDERS

The examples shown here are a few of the countless number of production jobs that are now handled efficiently and more profitably on Pines Automatic Benders. They illustrate the versatility and the many cost-cutting advantages of cold forming round, square, rectangular, extruded, or hollow stock the "Pines-Way". Simplicity of tooling, uniform accuracy, and ease of operation are proven features of Pines machines which today help hundreds of plants cut product costs. At Pines you'll find an unmatched wealth of bending experience and creative tooling skill readily available to help you develop better methods and save time on production problems.

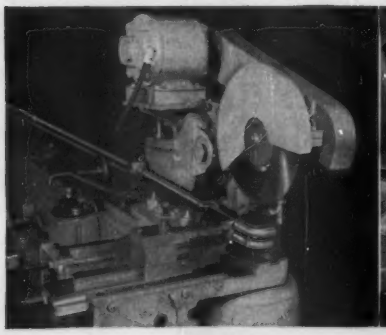
Write for *Free* **data sheets**

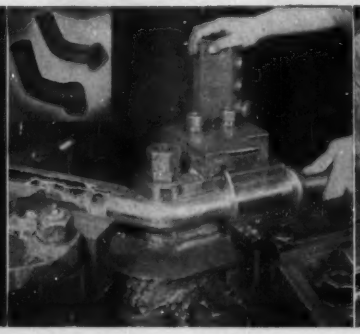
To keep abreast with latest developments in bending, write for copies of "Pines News" —bi-monthly mailing piece that gives facts on new, cost-cutting bending applications.

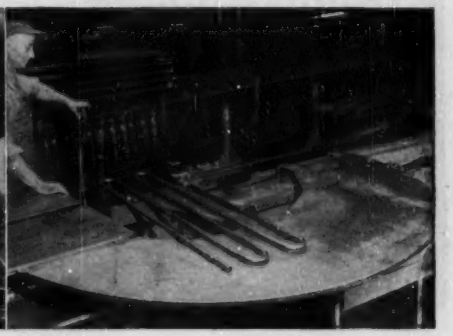
PINES ENGINEERING CO., INC.
Specialists in Tube Fabricating Machinery
672 WALNUT • AURORA, ILLINOIS

5 ENGINE MANIFOLD TUBES—Short 1⅛" O. D. steel tube now bent to 1⅛" c/l radius with flange attached saves space, insures accuracy, cuts costs.

6 BOILER TUBE AND REFRIGERATION COILS — Typical setup bending continuous serpentine coils from ¾" steel tubing. Reduces welding, fabricating costs. Other installations range from ¼" copper up to 3" steel tube.







USE YOUR SOLVENT DRUM FOR A TANK!
CUT COSTS IN SMALL PARTS CLEANING!
with the
MANPRO BAR-L DEGREASER

Small Investment...Efficient Cleaning...No Fire Hazard...Use Any Drum and It Will Pay for Itself Quickly!

FREE TRIAL OFFER! Try the Bar-L in your own plant. Write Today

Anyone can operate the BAR-L. It consists of a heating element, work rest, condenser with a corrosion-resistant hood, and controls. *The drum in which solvent is shipped is used for the tank!*

It's completely safe! The BAR-L uses a non-explosive, non-flammable solvent.

HOW THE BAR-L DEGREASER WORKS! Solvent is heated in lower section of drum. Vapors condense on work and wash parts in about 60 seconds. Anything that fits drum can be cleaned in a BAR-L.

MANUFACTURERS PROCESSING CO.
MANPRO METAL CLEANING EQUIPMENT AND CHEMICALS
7356 Hilton Road — Detroit 20, Michigan
Branches: Cleveland, Ohio, and Grand Rapids, Mich.
Representatives in Principal Industrial Centers

Wolverine
Heavy Duty
QUICK ACTION
TOGGLE CLAMPS
Extra CLEARANCE
Extra SPEED

CQ-1100 SERIES TOGGLE CLAMP

Rugged construction—drop forgings, cast steel and solid bar stock.

• • •

Wolverine Toggle Clamps also available in several types and sizes of Standard Action and Push Action units.

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Wolverine Clamps are in use in almost every major industrial field and are specified by prominent engineering firms. Write for Bulletin.

WOLVERINE TOOL CO.
1484 E. WOODBRIDGE
DETROIT 7, MICHIGAN

LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License issued by John Milton Luers Patents Inc.

. . . BIG PRESS FEATURES
IN PRESS-RITE 5 TON POWER PRESS

This heavy duty Press-Rite does all of these 5 Ton jobs hour after hour, day after day . . . fast and at low cost. A real production unit. Low price. *Write for bulletin today.*

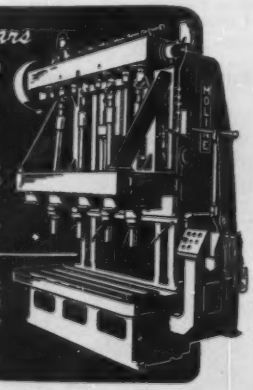
SALES SERVICE MACHINE TOOL CO.
2347 University Ave., St. Paul 14, Minn.

CENTERING
MACHINES
• HAND • SEMI-AUTOMATIC • AUTOMATIC
Special Machinery
HEBERT Equipment Co. • Romeo, Mich.

There are thousands of valuable facts and figures about real savings made with new machinery and equipment in your

1954 PRODUCTION PLANBOOK
for Metalworking

MOLINE
For Over 50 Years
"HOLE-HOG"
Specially Designed
MACHINE TOOLS
Have Cut Production Costs for American Industry



MOLINE TOOL CO.

No. HU68—Hydraulic rail feed universal joint type multiple spindle drilling machine.

RANDALL and STICKNEY
Dial Gauges and Indicators

Model C 50 B

are accurate, reliable and built to stand hard usage.

Model "C 50 B" has a 2¼" overall diameter, balanced dial 0-25-0 with .0005" graduations, ⅛" range and movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
248 Ash St.
Waltham 54, Mass., U.S.A.
Makers of Dial Gauges Since 1896

new hob list

CUTTERS • BROACHES • SPECIAL TOOLS

... to help you engineer the gears you need

BRAD FOOTE GEAR WORKS, INC.
CICERO 50, ILLINOIS

56-page Catalog *of tools for making*

WORMS	WORM GEARS
HERRINGBONE	SPUR
STRAIGHT BEVEL	ZEROL
INTERNAL	SPIRAL BEVEL
RACKS	ACME SCREWS
SPROCKETS	SPLINES
KEYWAYS	

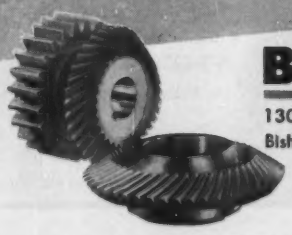
Here's the Way You Can Save Money on Gears

During the many years BRAD FOOTE has been making gears, we have accumulated a large variety of hobs, cutters, and broaches which we have used to make thousands upon thousands of gears to order. With this stock of tools, we are able to do just about any gear cutting job you may have.

By laying out your gears to be made with these tools, you can get what you need quicker . . . and cheaper

Write today on your company letterhead for a free copy of this big catalog which shows all the important specifications needed by gear designers. You'll find it convenient to use, and it will save you money on the gears you buy.

IMPORTANT NOTE: *If you now make your own gears, ask for a copy anyway. You may find that it is cheaper for us to make them.*



BRAD FOOTE GEAR WORKS, INC.

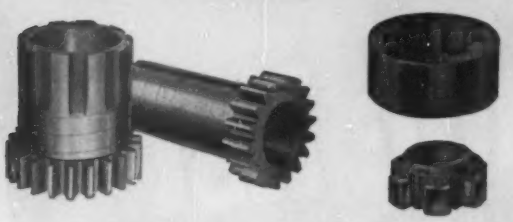
1309 South Cicero Avenue • Cicero 50, Illinois
Bishop 2-1070 • OLympic 2-7700 • TWX: CIC-2856-U

subsidiaries

AMERICAN GEAR & MFG. CO. • Phone: Lemont 920 • Lemont, Illinois

PITTSBURGH GEAR COMPANY • Phone: SPaulding 1-4600 • Pittsburgh 25, Pennsylvania

MADE WITH PRECISION—
SOLD WITH CONFIDENCE



Each gear order we receive, no matter what the specifications or quantity, gets our very closest attention. Each step of gear manufacture is carefully controlled to assure lasting service and satisfaction. THE ADAMS COMPANY, 1905 Bridge Street, Dubuque, Iowa.

the ADAMS line . . .

SPUR GEARS	INTERNAL GEARS	SHAVED TOOTH
BEVEL AND	(Spur and Helical)	GEARS
MITER GEARS	RATCHETS	(Spur and Helical)
WORMS AND	SPLINED SHAFTS	GROUND THREAD
WORM GEARS	LEAD AND FEED	WORMS
SPROCKETS	SCREWS	RACKS

The ADAMS Company
Dubuque, Iowa, U. S. A.
ESTABLISHED 1883

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS

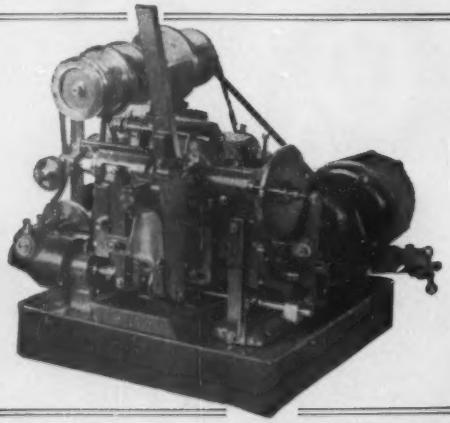
Fine quality Gears can now be STAMPED by Winzeler, with a degree of *uniform* accuracy you never thought possible! That's why they are used so successfully in many unusual applications. Extremely skillful tooling, stamping and assembling by staking, brazing or riveting performed with speed and low cost efficiency in production runs only! Stock and custom dies. Ask our capable engineers for ideas and cost estimates.

SEND FOR *4-page folder containing valuable Stamped Gear data and tables. Write today!*

WINZELER Stamped Gears

WINZELER MANUFACTURING & TOOL CO.
1712 WEST ARCADE PLACE, CHICAGO 12, ILLINOIS

WALTHAM
PINION AND GEAR CUTTING MACHINES



Fast, Convenient, Compact, Accurate

Designed to make high speed production of small gears and pinions available for assembly in watches, instruments, gauges, fuses, etc. Made in Single-Cut, Multiple Cut and Magazine-Feed types. Simple to operate; require no special skill.

Send for detailed information and complete specifications.

WALTHAM MACHINE WORKS
High Street, Waltham, Mass.

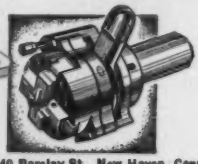
DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1 in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

H&G Insert Chaser DIE HEADS



famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

THE EASTERN MACHINE SCREW CORP., 28-40 Barclay St., New Haven, Conn.
Pacific Coast Representative: *A. C. Behringer, 334 N. San Pedro St., Los Angeles, Calif.* Canada: *F. F. Barber Machinery Co., Toronto, Can.*

HIGH QUALITY
spiral bevel gears

- Heat treated and lapped in matched sets for high speed operation.
- Pitch diameter 2.5" to 14"
- Diametral Pitch 3 to 7
- Production lots only
- Submit prints for estimates

AMARILLO GEAR WORKS
215 N. Polk St. Amarillo, Texas

ASSISTANT SUPERINTENDENT

Well established, soundly financed company in New York suburban area needs man with 5 or more years responsible supervisory experience in erecting medium size automatic machinery on a production basis. Will supervise, through foreman, a work force of 75-90 erectors. Replies, which will be treated confidentially, should include names of companies worked for, their products and recent salary history.

P-3472, AMERICAN MACHINIST
330 W. 42 St. New York 36, N. Y.

Wanted
EXPERIENCED MACHINE TOOL SALESMAN

Who wants rare opportunity: Live in California. Locate with California's leading Machine Tool Dealer. Representing Nation's leading Machine Tool Manufacturers. Earn Tops in Industry. Write
MOORE MACHINERY CO.
700 Minnesota St., San Francisco 7, Calif.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

CHIEF TOOL Engineer—with broad experience in tooling, metal stampings and assemblies. Responsibilities—tool engineering, toolroom, design, estimating and methods. Medium size company located in Philadelphia, Pa. Good future to man who can produce. Submit complete resume. P-3181, American Machinist.

POSITION WANTED

MACHINE TOOL engineer specializing in foreign trade and with considerable machine tool experience from Europe, also Central and South America, with dealer and direct plant relations, would like to connect with manufacturer. PW-3459, American Machinist.

BUSINESS OPPORTUNITY

CARBIDE TOOL Shop, 1952 sales $60,000; complete equipment, lathes, grinders, verticals, horizontal mills, drill presses, small tools, and rubber curing equipment, etc., 1800 ft. bldg., lot 150x165 deep, large N.E. Ohio city, on main highway, priced with property at $43,800. Apple Co., Brokers, Cleveland, O.

CONTRACT WORK WANTED

Old-Established firm, already making under license certain American Machines, open for similar arrangement with any firm desirous of having manufactured special machines which have an appeal, and need high-class workmanship. CWW-3051, American Machinist.

CONTRACT WORK

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10 to 12 ft. Lengths
ALL METALS
Also special screw machine products to order
EASTERN MACHINE SCREW
26-40 Barclay St.
New Haven, Conn.
Makers of
H & G DIE HEADS

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Ruck Street Cincinnati, Ohio

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: **"OPPORTUNITIES"** EQUIPMENT: USED OR RESALE

UNDISPLAYED ——RATES—— DISPLAYED

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Position Wanted advertising rates are ½ the above rate payable in advance.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display and advertisements.

The advertising rate is $12.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

We Want to Acquire by Purchase or License A NEW LINE OF MACHINE TOOLS

Our client—a large, long established manufacturer of high precision machinery—wants a new and distinctive product line. We shall be interested in:

1. A small or medium size machine tool, such as a jig borer, surface grinder, contour grinder, broaching machine, gear generator, etc.
2. An accessory or attachment for machine tools.

The machine, accessory or attachment must be developed to the point of commercial use. Our client is prepared to supply working capital and production facilities needed for rapid development of the business.

Please write, referring to advertisement #83. No commission to us. We are compensated by our client.

WELLING & WOODARD, INCORPORATED
Consultants in Diversification and New Products
52 VANDERBILT AVENUE NEW YORK 17, N. Y.

PEACOCK CORPORATION
Propane Gas Installations
and
Anhydrous Ammonia Plants
Paul E. Peacock, Jr., Pres.
Box 268 Westfield, N. J. Westfield 2-6258

MACHINE TOOL RECONDITIONING & the Art of Hand Scraping
— illustrated —
Write today for folder describing book
MACHINE TOOL PUBLICATIONS
215 Commerce Bldg., Fourth & Wabasha Sts.
St. Paul 1, Minn.

OWNER OF PATENT
on tool for grinding cams
SEEKS LICENSEE WITH SALES OUTLETS

This is a unique tool for producing a great variety of cam shapes and every job shop is a prospect. Nothing comparable now on market. Should have large sale at high profit. For particulars address

SAM TIERNEY,
Patent Department
ROHR AIRCRAFT CORPORATION
Chula Vista, California

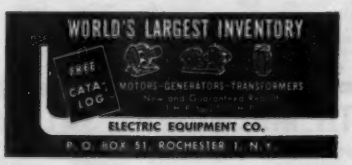
HYDRAULIC PRESSES
REPAIRED AND REBUILT

Complete line of new presses available including: "C" Frame Presses up to 100 tons; Hobbing Presses up to 2,000 tons; Up and Down-Acting Presses up to 600 tons; Hydraulic Power Units up to 10,000 P.S.I.

Write for illustrated 36-page catalog.

"C" Frame Press Model #11, 10-ton capacity

CLIFTON HYDRAULIC PRESS CO.
290 Alwood Rd.
Clifton, New Jersey



WANTED
PINION GRINDER
1—Gleason No. 15. Give serial, list of equipment, and motor specifications.
D. E. DONY MACHINERY CO.
4357 St. Paul Blvd., Rochester 17, N. Y.

UNUSUAL ITEMS

Priced To Sell!

Bullard 44" Maxi-Mill—M.D. All Rapid Traverse, 2 Swivel Heads on Rail, New 1927. Exceptionally Clean $5950.00

Heald 72A5—65" extended bed bridge type Internal Grinder, New 1941. Cost $18,000.00 ..... $4250.00

Potter & Johnston 6DREL Automatic Chucker, new 1940 But Never Run. New Cost $20,805.00 ..... $9750.00

Barber-Colman Type A Gear Hobber, Serial #2488. Power Down Feed. 2 spindle slide. New 1947. Used very little. Excellent Condition. New cost $12,000..... $5,950.00

Foster Hydraulic Superfinisher 4"x18" cap. New 1942. New cost $6280.00..... $450.00

Complete stock list upon request.

UNITED MACHINERY and Tool Corp.
85 Thomas St., Worcester 8, Mass.
Telephone 6-7171

1941-1954 MACHINE TOOLS

CUTTER & TOOL GRINDERS
FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit

DRILLING MACHINES
ALLEN: No. 2 Drill—6 Spindle, 8" overhang
ALLEN: #2½ High Speed 15"
BARNES: No. 210, 2-spindle, 21" Swing
PRATT & WHITNEY: ⅜B x 50 Deep Hole Drilling & Reaming Machine, 2-spindle
RADIAL DRILLS: Archdale, 5', 6' & 7', new

GEAR MACHINERY
FELLOWS: 61A & 64A Shaper, 18" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)
INTERNAL GEAR GRINDER, GG-31

GEAR TESTERS
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 3 Bevel Gear Tester
GLEASON No. 4 and No. 6 Bevel Gear Testers, Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GEAR HOBBERS
CLEVELAND: #130 & 140 Rigidhobbers
REINECKER 60"
BROWN & SHARPE No. 44 20" cap.
SCHUCHARDT & SCHUTTE, 36" cap.
LEES BRADNER 49A

GRINDERS—CYLINDRICAL
BROWN & SHARPE: No. 10 cap. 6"x18" plain
CINCINNATI: 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 12"x18" Type C, Universal
NORTON: 10"x36", 30 Deg. Angle Wheel
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE
GEAR GRIND MACH.: GG-19, 10"x24" Hydr. Spur Gears and Splines
GLEASON: #17, 23½" P.D.
PRATT & WHITNEY: 10" single and double
INTERNAL GEAR GRINDER, GG-31 wheel, hydraulic feed

GRINDERS—INTERNAL
BRYANT: Nos. 5, 5Y, 16-16, 16-CP-16, 16-25, 24-L-36
HEALD: #50 Planetary
HEALD: #72A3 Sizematic
HEALD: #72A3 & #72A5 Extended Bridge

GRINDERS—RADIUS
VAN NORMAN: #78, capacity 7½"
VAN NORMAN: #649-16, cap. 6" to 16" dia.
VAN NORMAN: #3½" Un. Radius

HONING MACHINES
BARNES: Model 224, 4" dia. x 16" stroke
BARNES: Model 172, 7" stroke.
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-3 Single End Horizontal, 2 spindle, ¼" to 1" dia.

LAPPING MACHINES
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES—PRODUCTION
BLOUNT: Polishing speed lathe 12" dia. x 48" centers
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
POTTER — JOHNSTON: #4D Auto Turret

LATHES—TURRET
BULLARD: 36" Vertical turret
WARNER & SWASEY: #1A, #2A, #3, #3A, #4, #4A & #5
HERBERT: #0, #2, #4, #7, #8 and #9B/30 Sizes, new

LATHES—TURRET—continued
WEBSTER & BENNETT: Vert. 36" & 48" (New)

MILLING MACHINES
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: 4" Twin Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

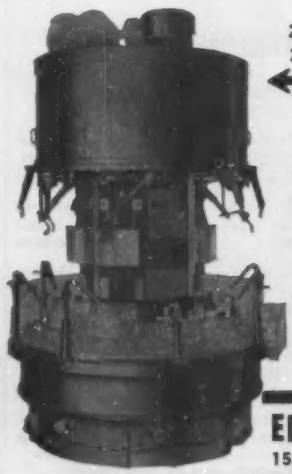
SAWS & CUT-OFF MACHINES
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)
MOTCH & MERRYWEATHER: No. 8 Circular Saw with auto. stock feed
MARVEL: No. 6A Hacksaw, 6"x6"

THREAD MILLERS & TAPPERS
HALL PLANETARY: Mod "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 18½" hole
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity.
NATCO: 16 spindle Tapper ¾" cap.

MISCELLANEOUS
GARDNER: Model 84A Double Disc Grinder, 23" Wheel
MOLDING MACHINES, ROLLER JOLT: Osborne Model 2047-3
AUTOMATIC SCREW MACHINE, Wickman Single Spindle, 7/16" New
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½" & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
HARDNESS TESTER: Grogan Brinell, 16-8
SHEFFIELD: Precisionaire Gauge
SUNDSTRAND: Double-End, #53, 42" & 60" Centering Mach.
WIRE FORMING MACHINES: 4-slides (new)

TRIPLEX MACHINE TOOL CORP. ESTABLISHED 1919
75A West Street, New York 6, New York — Cable Address TRIMACTOOL

EXCELLENT PRODUCTION MACHINERY
TO FILL THE GAP IN YOUR PLANT



BULLARD MULT-AU-MATICS
2—Type D, 12", 8 spindle S/N 16878—22157
2—Type D, 8", 8 spindle S/N 15170-14966

ALSO AVAILABLE FROM STOCK

CRANKSHAFT MACHINERY
2—Wiskes Crank Shaft Pin & Flange Turning Lathes
2—Milling Crank Shaft Flange & Turning Lathes
2—Snyder Multi-Spindle Crank Shaft Second Operation Machines—All Late Equipment and in Excellent Condition
2—No. 2 LeBlond Center Drive Crankshaft Lathes, 30 HP, Ser. A-7112, A-7100

GEAR EQUIPMENT
7—Fellows Model No. 7 High-Sp. Gear Shapers S/N FS168, FS186, FS234, FS-240, FS262, FS263, 15237
1—Cleveland Model No. 220—8 Spindle Hobber S/N 86-682
1—Fellows Model 75 High-Speed Gear Shaper S/N 15418
2—Fellows Model 725A High-Sp. Gear Shapers S/N 18714-19201
2—National Red Ring GCC 8" & 12" Gear Shavers, Ser. 170 & 334
1—Cross No. 40 Duplex Chamfering Machine.

MILLS
New No. 3 Graham Universal High Speed Dial Type Mill, No. 50 Taper, 12x60" table, power rapid traverse in all directions, vertical divid. heads.

GRINDERS
1—Landis Pin Grinder
4T Fellows Thread Generator

Phone VAlley 2-4830 — 2-1060

ED SMITH MACHINERY SALES
1527 Lillibridge Ave. Detroit 14, Mich.

"LOOK THESE OVER"

No. 45 HEALD Borematic, Single End, Two Spindle
12x30" MONARCH Geared Head Lathes
22"x336" MONARCH Model "M" Lathe, Two Carriages, M.D.
24"x12' BOYE & EMMES Hvy Dty Engine Lathe
30"x18' bed AMERICAN High Duty Geared Head Lathe
36"x17' centers AMERICAN Heavy Duty Geared Head Lathe, 1941
42"x15' AMERICAN Heavy Duty Lathe
42"x25' centers AMERICAN Heavy Duty Lathe
60"x18' LeBLOND Heavy Duty Geared Head Lathe New 1952
Nos. 5A and 5Y BRYANT Internal Grinders
10x36 HILL CLARKE Plain Cylindrical Grinder
No. 172 HEALD Gap Internal Grinding Machine for large swing
10"x72" LANDIS Type C Hydraulic Plain Grinder —1942
24"x276" LANDIS Type B Hydraulic Pl. Grinder
Nos. 4D and 6S POTTER & JOHNSTON Automatic Lathes.
IL GISHOLT Universal Turret Lathe, 1946.
No. 8A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathes.
No. 2 CINCINNATI HS Dial Type Plain Millers.
No. 0-8 CINCINNATI Plain Milling Machines.
No 2M CINCINNATI Vertical Miller 1941
FITCHBURG Plain Horizontal Mfg. Type Milling Machine, 24"x72" table.
No 1-18 CINCINNATI Plain Mfg Miller
No. 3B BROWN & SHARPE Dual Control Plain Miller
No. 5 CINCINNATI High Power Plain Miller with motorized overarm
3'11" CARLTON Radial Drill
CINCINNATI BICKFORD Precision Drilling Machine with Bullard Man-au-Trol Table.
E-5 & 2AL NATCO Multiple Spindle Drilling Machine
Nos. 64 and 72 FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver, 1943.
No. 36BM GOULD & EBERHARDT Gear Roughers
16/20" GOULD & EBERHARDT Industrial Shaper
36" OHIO "DREADNAUGHT" H.D. Shaper
100" BETTS Vertical Boring Mill, 2 heads.

WIGGLESWORTH INDUSTRIAL CORPORATION
203 Bent St. Cambridge 41, Mass.

Hardinge Model H.C.T. Chucker, 1944.
Fellows Straight Line Generator.
Gleason 3" Straight Gear Generator.
Ingersoll 36"x36"x12' Mill, 1928, adj. rail, 4 heads.

D. E. DONY MACHINERY CO.
4357 St. Paul Blvd., Rochester 17, N. Y.

1—#3 CINCINNATI VERTICAL MILLING MACHINE
G.E. Reduction Motor Model 68A3.
Table 59" x 13½"—16" Throat.
Machine in operation.
Write
WM. KRATT COMPANY
988 JOHNSON PLACE UNION, N. J.

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Every Item Guaranteed as Represented

24"x10' AXELSON GEARED HEAD, HEAVY DUTY MODEL "E" 28" ACTUAL SWING, M.D. TAPER ATTACHMENT.

LATHES

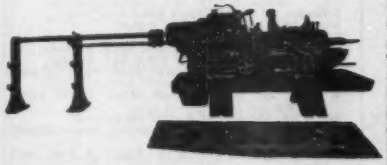
24"x12' BOYE & EMMES Timken Bearing, Geared Head, Lathe. Late Type.

27"x16' NILES, BEMENT, & POND Geared Head Lathe, 9' centers, M.D.

24", 36" BULLARD Vertical Turret Lathe, New Era, Turret Head, Side Head, Motor Driven.

No. 601 W.D. OSTER Motor Driven Turret Lathe, 1½" capacity, Late.

No. 2, No. 5 WARNER & SWASEY Geared Head Turret Lathes, Bar Feed, Motor Driven.



No. 7 BARDONS & OLIVER Universal Turret Lathe. 2½" capacity. Preselector Head, Late Type.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, Motor Driven, Late type.

No. 1 LaPOINTE Motor Driven Horizontal Broach, 5 tons cap., 38" stroke.

50 HP. CHICAGO PNEUMATIC Air Compressor. Type NSB, 253 CFM, Piston Displacement.

10"x10" RACINE #30-C Hydraulic Heavy Duty Shear Cut Power Hack Saw, 1946.

10'x10 ga., 10'x¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

10'x10 ga. CINCINNATI Power Squaring Shear, many extra features; NEW 1948.

MILLING MACHINES

#2-18 CINCINNATI Plain Auto. Milling Machine, M.D. Late Type.

#2 KEMPSMITH Horiz. Maxi-Mill, Motor in base, Vert. Head.

#08 CINCINNATI Vert. Mill, Plain & Rotary Table Type.

#3B KEARNEY & TRECKER Vertical Milling Machine, Motor in base.

No. 0-8 CINCINNATI Rise & Fall Horiz. Mill, Late Model.

No. 3B KEARNEY & TRECKER Horiz. Mill, Double Overarm, Motor in base.

No. 2M CINCINNATI Universal Horizontal Mill, Full Equipment, M.D.

96" x 86" x 28' NEWTON PLANER TYPE MILLING MACHINE. 2 Heads on Rail; 2 Side Heads; Pendant Control; Late Type; Inspect under power.

DRILLING MACHINES

4'x15" Column CINCINNATI-BICKFORD "Super-Service" Radial Drill, Motor on arm, Box table.

4' x 15" CARLTON Radial Drill, Motor on arm, 48 spindle speeds, 1943, Late Type.

No. 262 BARNES Motor Driven Sliding Head Drill Press. 2" cap. in steel.

No. 2 M.T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive, Late Type.

#M200 DEFIANCE Production Drilling Machine. 2" Cap. in Steel.

#5 M.T., Coolant System. Late Type. 26" Swing, 1942.

#7A THOMAS open back inclinable Press 80 Ton cap. Flywheel M.D.

No. 5 FEDERAL Open Back Inclinable 4" stroke, Timken Bearing Flywheel, M.D.

600 ton NILES-BEMENT-POND Motor Driven Wheel Press, 86" between strain rods, 14' cap., 17" diam. ram.

#5, #7 JOHNSON O.B.I. Presses. 56, 79 tons cap. M.D. Flywheel & Geared Type.

GRINDERS

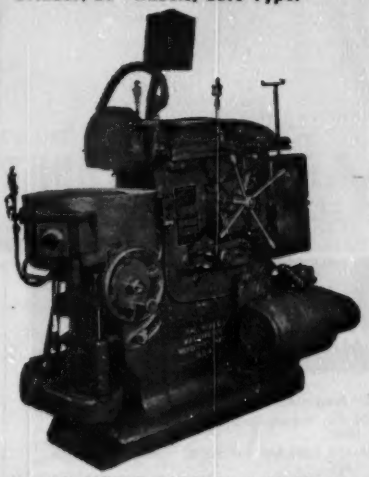
12"x36" LANDIS Universal Cylindrical Grinder with Excello Internal Spindle, M.D.

6"x18" LANDIS Type "C" M.D. Hyd. Cylindrical Grinder, Serial #29196.

6"x18" NORTON Vertical Hydraulic Surface Grinder, complete with magnetic chucks, coolant systems, Late.

#TG615 JONES & LAMSON Thread Grinder, Late, M.D. and TG848.

No. 208 BESLEY Motor Driven Disc Grinder, 26" wheels, Late Type.



No. 22 HEALD MOTOR DRIVEN ROTARY SURFACE GRINDER. 12" Magnetic Chuck. Late Model.

20", 24", 28" GOULD & EBERHARDT V-Ram Shapers, M.D.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

30 K.W. LEPEL High Frequency Induction Heater.

No. 8LS FELLOWS M.D. Gear Lapping Machine. With Detachable Head, Universal Work Support.

No. 20, WATERBURY FARREL Thread Roller, ⅜" cap., 1944.

#0, ½, 1½ BUFFALO FORGE Universal Ironworker, Notcher, M.D.

6'x¼" VERSON Power Press Brake, 8' overall, late type.

15' x 10' x 36' BETTS PLANER, DOUBLE HOUSING, BOX TABLE, 2 Swivel Heads on Rail; 2 Swivel Side Heads; Pendant Control Variable Speed Main Drive Motor, 75 HP. Inspect under power.

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AUTOMATICS
Brown & Sharpe (1) Model #4
Brown & Sharpe (2) Model 2G, 1¼" & 1½"
Brown & Sharpe (8) Model 0G, ⅝" capacity.
Brown & Sharpe (4) Model 00G, ⅜" capacity.
Ceco Screw Machine ⅜" capacity.
Cleveland Model AA-11. Model B.
Cleveland 1½", Conomatic 4 Sp.
New Britain 4 sp. Model 49.

BORING MILLS
Bullard 24" V.T.L. Spiral Drive
Bullard 8"—8 spindle, Multi-Matic
Cleveland 2½" Bar Capacity, Defiance 3¾" Bar
Giddings & Lewis #32, 3", #25, 2½" Bar
Kings 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4" 4½" Bar, 60" Vert.
Ohio 5" Bar. Universal 3"
Morris 6'—Radial. Lucas 3" New 1951.

DRILLS AND RADIALS
American 6'x15", American 6'x17", 3'9"
Baker No. 321 Vertical Boring & Drill
Buffalo #2 Motor Spindle, #16—4 Sp.
Buffalo: Power No. 41, No. 42 RPMSTERS
Cincinnati Bickford 6'15" cal. 3'9"
Natco #12, 20 spindle. Model B2A—10 Sp.
Leland-Gifford 2 LMS, 3MS

ENGRAVERS
Gorton #ME, 3U, 1D, 3Z, Deckel G1L, G1, G2
Gorton Graduating Mod. #687-1
Gorton P13 3 Dimensional Like New
Taylor-Hobson 3 dimensional Pantograph

GRINDERS, MISCELLANEOUS
Brown & Sharpe #2 Universal 14"x28", #3 Univ.
Brown & Sharpe #5, 3"x18" Cylindrical
Brown & Sharpe #13 Universal Tool & Cutter
Cincinnati 6x18" Hyd. #4—Centerless—#2
Douglas Tool & Cutter 8"x15"
Gardner Disc Grinder 30"—15 H.P. Motor
Heald 72A3 Int. Centerless Sizematic
J. & L. Thread: TG 615, Lempco 54" Swing
Landis 6"x30" Type C Cyl., 10x24 Univ. 12x30
Norton #2 Tool & Cutter, No. 1 Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl.

GRINDERS, SURFACE
New 9x24" Hyd. Feed 10x8", 6x18
Abrasive 8x24", #33 Vert. & #34
Brown & Sharpe #5, #2 with Chuck
Gallmeyer & Livingston—65
Heald 22—12" chuck, Arter 12", Covel No. 15
Norton 6x18 Hyd. #15 Covel Hand.
Portman 12" Chuck Rotary
Pratt & Whitney 12x36" Vertical
Thompson 6x18, Reid 2A, 6x18

GEAR EQUIPMENT
Barber Colman #18 Hob Grinder
Barber-Colman Mod. SHS, Sharpener
Barber-Colman #3, #2, #12 (3) also Type S
Fellows High Speed Shapers 712, 725, 71, 7, 61A
Gleason Gear Rougher, Gleason #6 Power Tester
Gleason #2 Surface Hardener, No. 3 Gear Tester
Gleason #3 Spiral, #3 Straight Bevel
Mikron No. 79 Gear Hobbers
Michigan Univ. Hob & Cutter Relieving
Sykes 2A Generator

LATHES
American 12"x30", Bridgeford 36"x20", 32"x16'
Cincinnati 22"x10'
Gisholt Simplimatic 18"x16½", 2 Tables
Hendey 12"x42 and 12x30", 16x160"
LeBlond Regal 10"x3' bed, 13x42", 17" Late type
LeBlond 25/50x96" Gap, Late type.
Lodge & Shipley #3A Duomatics
Pratt & Whitney 16"x60, 10"x20", 16"x36
Monarch Magna-matic 14"x54"
Rivett Model 918 Precision. Mod. 715
Putnam, Sliding Gap 22"/46"x92"
Sebastian 14"x6", So. Bend 13"x42", 14"x28"
South Bend 13"x5' O.C.G., 10"x3½ Taper Att.
Sundstrand 8x15", 15' Stub

HYDRAULIC EQUIPMENT
Injection Molders, Pumps, Presses 125 to 800 Tons. Accumulators, Hobbing Presses, Etc.
Completely Engineered by a Competent Staff

MILLS, VERTICAL
Cincinnati (2)—1-18 Plain Automatic
Cincinnati #3, 08 Vertical
Gorton 8D Super Speed, 8½D, 9J
Milwaukee 4K & 2K
Morey #12M Profiler, 2 sp. #2 Maximiller
Reed Prentice Vert. Mill & Die Sinker Mod. 3VG

MILLS, PLAIN, UNIV. PROD.
Brown & Sharpe #0 Omniversal, #000 Production
Brown & Sharpe #2B Plain, No. 2, 3A, 21, #2L
Cinn. 08 Rise & Fall, 2-24 Automatic
Cinn. #3, 4 Plain, #18 Mfg. #5-48 Hydro.
Kent Owens IV, 1-8, 1-14, IM, 2-20
Milwaukee 2H Universal, 2H Plain
Milwaukee #2B, Plain & Univ.
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ.
(8) Van Norman #12—Hor/vert—No. 36, 22

PRESSES
Bliss 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 53, 62, 162, OB
Bliss #78½, 330 Ton SS, Bliss 74½
Bliss 5-48 Dbl. 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Stokes Tablet Presses, Mod. R, RD3, RD3S, DDS
Thomas 56 Ton O.B.I.
Walsh No. 3 O.B.I. 23 Ton, L1 #3
Z & H #4½, O.B.I. 20 Ton, 36-6 Back Gear

TURRET LATHES
Bardons & Oliver #2, 3, 7 Bar Feed
Gisholt 2L, Cross Slid. Tur. & Hardinge DSM-59
Gisholt #5, Bar Feed, Plenty of Tools
Gisholt 4R—9¼" hole in spindles
Jones & Lamson Mod. 8A, No. 5
Warner & Swasey #1, 1A, 2, 2A, 3, 3A, 4, 5

MISCELLANEOUS
Band Saw: New Kalamazoo & Johnson. Grob.
Bending Roll: Reed-Power 5", 48"—8 ga.
Bolt & Pipe Threader: Landis, Oster-Williams
Broach: New 6-Ton Horizontal, 11 Ton Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6", Marvel #9

This is but a partial listing. Hundreds of others in stock.

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LATE TYPE MACHINE TOOLS

48" Jungenthal Vertical Turret Lathe. New.
650 Ton Verson Double Action Eccentric Press. 1940.
HP-100 LaPointe Horizontal Hydraulic Broach. 1945.
10" Pratt & Whitney Hyd. Gear Grinder. 1941.
12" Gleason Gear Generator. 1942.
No. 7 Gleason "Revex" Gear Rougher. 1943.
No. EF Cleveland Dble. End Punch & Shear—54" throat.
16"x72" Norton Univ. Grinder. 1942.
17"x42" Norton Crank-o-Matic, 1943.
645 Fellows Gear Shaper 1942
TG615 Jones & Lamson Precision.
No. 35 Excello Precision Thread Grinder.
20"x33" Fay Automatic Lathe 1942.
24-36 Bryant Hydraulic Internal Grinder. 1942.
No. 72A3 Heald Plain Hydraulic Internal Grinder. 1941.
#2 Cincinnati Centerless Grinder 1945
No. 26 Norton Hyprolap 1942
No. 6DRE Potter & Johnston Automatic. Late.
No. H5 Libby Universal Saddle Type Turret Lathe. 1939.
No. 3R Gisholt Universal Saddle Type Turret Lathe. 1942.
No. 33 Sundstrand Vertical Rigidmil 1943

Write for Complete Stock List

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MACHINERY & SUPPLY CO.
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CUTTER SHARPENER

No. 7 Gleason Hypoid Cutter Sharpener. Hand index, hand feed with coolant. Manufactured Dec. 1948. Serial #24766.

Used about 2 months. Like new condition.

Price $500 net

W. C. COWDEN
Machinery Company
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USED MACHINERY

Columbia 10' Power Square Shear 3/16" cap.
Baush 44" Vert. Boring Mill 2 heads
Knight #40 Vert. Jig Borer
American 20"x8' Grd. Hd. Lathe motor in base
Landis 20"x72" and 18"x96" Plain Ext. Grinder
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table.
W & S No. 2-A Grd. Hd. Univ. Turret Lathe chucking.
Rivett No. 134 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.O.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Table.
Heald No. 72A-3 Hydr. Int. Grinder Red Head Sp.
LeBlond 27"x12' Bed Grd. Hd. Q.C.C. Lathe 13' hollow spindle.
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
G & L 3" Bar Horiz. Boring Mill.
Barnes 20" All Grd. Camel Back Drill 1-Sp.
Blanchard M.D. Vert. Sp. Surf Grinder 20" chuck.
Campbell No. 215 abrasive cut off 1944.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Rot. Surf. Grinder 12" chuck 1942.
Landis 2-Sp. 2" Cap. Belt Threader M.D.
Hendey 18"x8' bed Q.C.G. Lathe 1939.
W & S No. 4 Ram Type Grd. Hd. Turret Lathe.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
Springfield Planer Type Surf. Grinder.
P & J #2 Auto. Prod. Miller, 2 Tables.
Foote-Burt #25 Box. Col. 1-Sp. Hvy. Drill.
L & N 6', 10' & 12" Press Brakes.
Bullard 24" & 30" Vert. Turret Lathes.
Lynd-Farquhar 20" stroke open-side Shaper Planer.

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ELECTRIC FURNACE TO 1850°
with Auto Temperature Control. Sliding door. Cheap to operate. Substantial Dependable for Machine Shop Tool Room.
8" x 12" x 15" inside 4.5 K.W. $250.00
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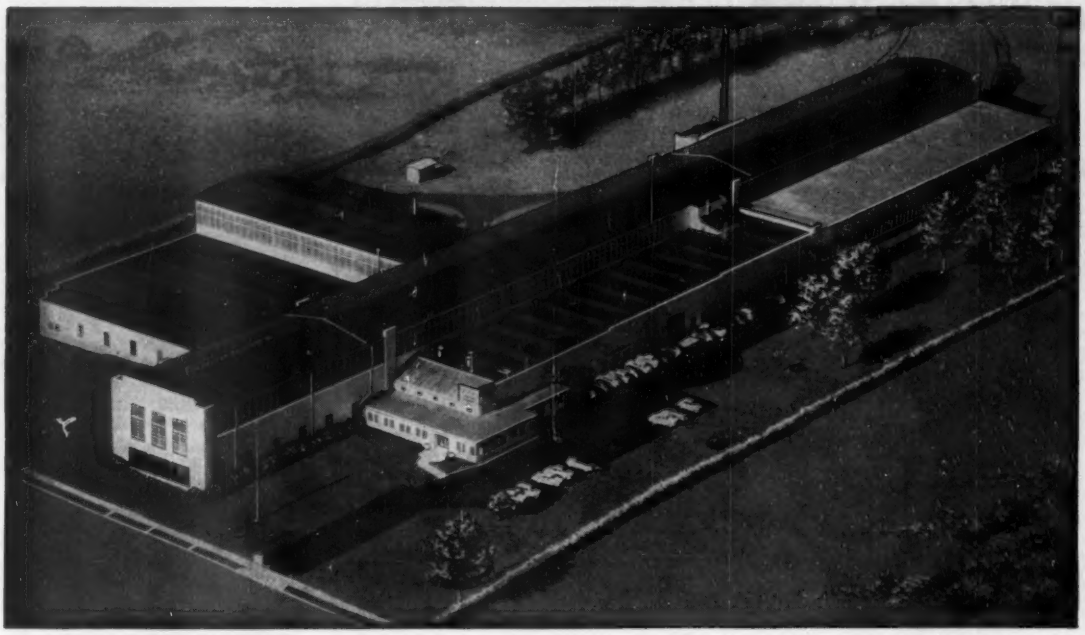

AUTOMATICS

⅞" Cleveland Model B, belt
No. 6C Potter & Johnston, m.d.
14" Fay Flanders Type, m.d.
No. 8A Cleveland, m.d., 8" cap., latest
Model B—1⅛" Cleveland, m.d.
No. 5 DELX Potter & Johnston, m.d., late
Model A—1⅜" Cleveland, Single Spindle, late
Model A—2" Cleveland, Single Spindle, late
Model A—3¼" Cleveland Single Spindle, late

BOLT THREADERS

Victor Nut Facing Machine, m.d., cap. ⅜" to 2" nuts
1" Landis Double Spindle, m.d. thru gear box
1½" Landis 2 spindle, late
1½" Landis 2 spindle, older type

HORIZONTAL BORING MILLS

Barrett Double End, 7" and 5" spindles, m.d.
No. 25T Giddings & Lewis Table Type, m.d.
No. 42 Lucas, m.d.
5½" bar Betts Floor Type, m.d.
5½" bar Niles-Bement-Pond, m.d.
6" bar Newton No. 2 Cylinder Borer, m.d.
10" bar Sellers Floor Type, m.d.
54"x11' Rectangular Table, 40" high
Floor Plate 6'11" wide by 9'11" long x 9½" thick, 6 T slots
Table 49" wide x 22' long x 7" thick, 4 rows T slots
Pair Floor Plates 32" wide x 18' long x 10½" thick
Natco Horizontal Production Boring Machine, m.d.

VERTICAL BORING MILLS

36" Bullard, m.d.
42" Bullard Spiral Drive, m.d.
42" Bullard New Era, m.d.
42" King, with side head and plain swivel head on rail
44" Putnam, m.d., p.r.t.
44" Niles, m.d., p.r.t
48" Niles-Bement-Pond Car Wheel Borer, m.d.
53" Niles Heavy Pattern, m.d., p.r.t.
54" Cincinnati "Hypro", m.d.
73" Niles, m.d., p.r.t.
100" Niles Heavy, m.d., p.r.t.
102" Niles Wheel Turning Boring Mill
12' Niles, m.d., p.r.t.

BROACHING MACHINES

75 H.P. LaPointe Hydraulic Broach, m.d.
12x72" Thompson Automatic Flat Broach, m.d.
10 ton, 84" stroke Single Ram Vertical Surface LaPointe, m.d., late
Type SBD-42-6 American Vertical Hy. Dup. Broach
Type SBD-48-15 American Vertical Dual Ram Surface Hydr. Broach

RADIAL DRILLS

2'-9" col. Fosdick, m.d.
2½'-10" col. American Triple Purpose Plain, m.d.
3'-10" col. American Triple Purpose Plain, m.d.
3'-9" col. Morris, m.d.
3'-13" col. Cincinnati-Bickford Super-Service, m.d.
4'-11" col. Cincinnati-Bickford, m.d.
4'-11" col. Morris, m.d. on arm
4'-13" col. American Triple Purpose Plain, m.d.
5'-14" col. Carlton, m.d.
5'-15" col. American Triple Purpose, m.d. on arm
7'-16" col. American Triple Purpose, m.d.
8'-17" col. Dreses, gear box m.d.
8'-19" col. Cincinnati-Bickford Super-Service, m.d.
Zero Precision Universal Bench Type Radials, m.d., new
Baush Radial Drilling & Tapping Machine, m.d.

BALL BEARING DRILLS

No. 15 Buffalo Floor Model, m.d.
No. 18 Canedy Otto Bench Model, m.d.
Providence Engineering Co., Model E, s.p.d.
No. ½, 1, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 4 Fosdick, 8" overarm, belted m.d., No. 2 Taper
1 spindle Allen, belted m.d.
2 spindle Allen, belted m.d., 8" overhang
No. 3 Allen, belted m.d.
No. 2LMS Leland-Gifford, single spindle, High Speed, m.d.
2 spindle Avey, size No. 1, type B, style VHP, m.d., 8" overhang
2 spindle Avey, No. 2, 3, belted m.d., p.f.
3 spindle Leland & Gifford #1LMS—High Speed, late, m.d.
2 spindle #2 Leland & Gifford High Speed, 8" overhang, m.d.
3 spindle Leland & Gifford High Speed Model 3MS, m.d.
4 spindle Allen High Speed, m.d.
4 spindle No. 3 Avey, belted m.d., No. 3 Taper, 12" overhang
4 spindle Leland & Gifford High Speed, m.d., on each spindle
6 spindle Leland & Gifford, m.d. on each spindle, No. 2 Taper
6 spindle Henry & Wright, m.d., 15" overhang, No. 2 Taper

IN ADDITION TO THE ABOVE, WE ALSO HAVE IN STOCK DRILLS, GRINDERS, HONING MACHINES, ENGINE LATHES, MFG. LATHES, MILLING MACHINES, PLANERS, SHAPERS, SLOTTERS, SAWS, RAILROAD MACHINERY, TURRET LATHES, ETC.

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CABLE ADDRESS EMCO

HILL-CLARKE MACHINERY COMPANY

For more complete list, send for our latest "Green List" #163

AUTOMATICS
1-1/16" Cleveland Model A (1942).

BORING MACHINES
No. DB2112 Excello Single End Borer.
100" Niles-B-Pond Vert. Bor. Mill.

DRILLS
No. 2 Avey Cam Fd. Drill. 14" Swing.
No. 2 MA-6 Avey 24"-1-Spdl.
2 Spdl.—24" SW.—No. 3 Avey.
No. K60H Fox 16 Spdl. Multi Drill.
No. 2 —20" 2-Spdl. Leland-Gifford LMS
No. LBM—20" 3 Spdl Leland-Gifford Drill.

GEAR MACHINES
11" Gleason Gear Generator.
No. 12HS Gould & Eberhardt.
No. 36-BM G. & E.—3 spdl. Rougher.
615-A Fellows Gear Shaper.
612-A Fellows Gear Shaper.

GRINDERS
No. 214 Besley Double End Disc Gdr.
5"x30" Cam-o-matic (1946).
6"x18" Norton Type C Plain (1943).
10"x36" Norton Type C Grinder.
10"x36" Norton Type C Cam Grinder.
10"x48" Norton Type C Pl. (1943).
No. 4 Cinn. Hi-Speed Dial Type Pl. (1944)
TG 615 J & L Thrd Gdr.
B24-25" Chuck Arter Surf.
No. 1109 Bryant Internal Gdr. (1951).
No. 5 Bryant Internal Grinder.
No. 5B Bryant Internal Grdr.
No. 16-16 Bryant Int. Grinder.
No. 16-28 Bryant Int. Grinder.
No. 16 A-28 Bryant Internal Grinder.
No. 16-38 Bryant Int. Gdr.
No. 24-26 Bryant Int. Grinder.
No. 24-36 Bryant Internal Grinder.
No. 24L—36 Bryant Hyd. Internal Gdr.
No. 81 Heald Internal Centerless.

HILL-CLARKE HORTON TYPE MOTOR DRIVEN GRINDERS
10"x36" Centers. 14"x36" Centers.
10"x72" Centers. 14"x50" Centers.
10"x96" Centers. 14"x72" Centers.
18"x96" Centers. 14"x96" Centers.
18"-30" gap x 96" Centers.
18"x120" Centers

HONES
Model H-2 Micromatic Horiz. Hone.
Model 200-H5-Dbl. End Micro. Horiz.
Model H-7 Micromatic Vert. Hone
No. 224 Barnes Vert. Hone
No. 306-H Barnes Vert. Hone.

LATHES
R-14 Seneca Falls Lo-Swing Lathe. (16"x33")
12"x21" Fay Auto.
12"x36" Fay Auto.
18"x6' Am. Geared Head Lathe.
27"x12' American Geared Hd. Lathe.
36"x18' Putnam Grd. Hd. M.D.
No. 2 Warner & Swasey Geared Head Tur.
No. 3 Warner & Swasey Bar Feed Turret.
No. 5W Acme Tur. Lathe (Late).
No. 3AL Gisholt, Cross-Slide Turret.
No. 4A Warner & Swasey Turret.
No. 6 Warner & Swasey, cone head, Turret.
2¼"x24" Jones & Lamson, turret.
3H-10 Libby International, 29" Sw.
18" Libby, M.D., turret.
No. 4A Warner & Swasey (1944).

PLANERS
48"x36"x14' Gray, 2 Heads.
48"x48"x12' Cincinnati, 2 Heads.
60"x48"x27' American, 4 Heads.

MILLING MACHINES
No. 3K Kearney & Trecker Vert.
No. 08 Cincinnati Vert. (1942).
4" Taylor & Fenn Duplex Spline.
10"x48" Hanson-Whitney Thrd. Mill.
10"x60" Pratt & Whitney Thrd. Mill.
12"x102" Mod. HT Lees Bradner Thrd. Mill.
54"x30"x16' Ingersoll Slab Mill.

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6" bar GIDDINGS & LEWIS Floor Type Horizontal Boring Mill, with hi-speed auxiliary spindle, floor plate, new 1942

16"x54" SIDNEY Toolroom Lathe, Taper, Chucks, Coolant, New 1941
28"x15' centers BERTRAM (Niles patterns) "Timesaver" Engine Lathe, 2 carriages, rapid traverse, AC-MD, new 1943
36"x12' centers AMERICAN Heavy Duty 16 Speed Geared Head Lathe, AC-MD
60"x20' NILES-BEMENT-POND Geared Head Engine Lathe, rapid traverse
No. 3 WARNER & SWASEY Turret Lathes, one bar feed, one chucker. New 1944
No. 4 WARNER & SWASEY Universal Turret Lathe, Preselector head, bar feed, late type.
No. 2 VAN NORMAN Plain Horizontal Mill. New 1943
No. 3-24 CINCINNATI Plain Hydromatic Mill, AC-MD

4" bar GIDDINGS & LEWIS Table Type Horizontal Boring Mill, extra wide table, new 1943

48"x48"x10' NILES Double Housing Planer, box table, DC reversing motor drive.
48"x48"x12' Cincinnati Double Housing Planer, power rapid traverse, DC reversing motor drive, box table, forced feed lubrication.
40" widened to 60"x12' DETRICK & HARVEY Double Housing Planer, box table, DC reversing motor drive
1½" LANDIS Bolt Threader, leadscrews, AC-MD
30" MORTON Hydraulic Keyseater, new 1942
No. 6A MITTS & MERRILL Keyseater, capacity 0 to 4" width, 36" stroke, tooling
4' FOSDICK Sensitive, New 1951
4' HAMMOND Jackknife Radial Drill, tapping attachment, new 1948
5'-13" column CARLTON Radial Drill, AC motor & gearbox on base
6'-17" column CINCINNATI BICKFORD Super Service Radial Drill, power rapid traverse, motor on arm
36" BULLARD High Speed, fine feed attachment, Vertical Boring Mill, rapid traverse, new 1942
42" BULLARD Spiral Drive Vertical Turret Lathe, extra high column
42" KING Vertical Boring Mill, 10HP AC motor, power rapid traverse
No. 5—55 Ton V & O, O.B.I. Press
No. 1 FISCHER Oil Groover, Taper Attachment, relieving attachment

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Warner & Swasey No. 1A Universal—Cap. 2½"—Swing 13½"—MD
Warner & Swasey No. 2A Universal—Preselector Head—Cap. 3½"—Bar Feed—MD
Warner & Swasey No. 3A Universal—Cap. 4½"—MD—Late Type
Warner & Swasey No's. 2, 3, 4 & 5 Ram Type Universal—Bar & Chucking—Tooling—MD—Late type

BORING MILLS
Bullard 24" and 36" Spiral Drive Type—Side heads—MD
(New) Model TV2100—Swing 82"—2 rail & 1 side head—47½" under rail—MD
Niles 100" Vertical—54" under tool holders—2 swivel heads—MD
Niles 12' Vertical—88" under tool holders—2 swivel heads—MD

PLANERS
Gray 36"x36"x32' Double Housing—2 rail & 2 side heads—MD
Gray 42"x42"x24' Double Housing—2 rail & 2 side heads—MD
Cincinnati 42"x30"x8' Double Housing Widened Patterns—2 heads on rail
Betts 15'x10'x36' Double Housing—2 rail & 2 side heads—75 HP MD

PLANER MILLERS
Ingersoll 48"x48"x14'—2 horizontal & 1 vertical head—MD
Cincinnati 72"x54"x16' Hypro—2 rail & 2 side heads—MD
Newton 96"x87"x26'—2 rail & 2 side heads—Spindles individually MD—Late type

MISCELLANEOUS
Cincinnati No. 5-42 Duplex Vertical Hydro Broach—Max. stroke of ram 42"—coolant—MD—1947 machine
Barber-Colman Type A gear Hobber—Cap. 12" dia. x 15" face—MD—1947 machine
Gould & Eberhardt 96"x30" Automatic Spur & Helical Gear Cutter—Power feeds—Auxiliary table—MD
Pfauter 118"x22" Automatic Spur, Helical & Worm Gear Cutter with attach for herringbone—MD

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GRINDER, 16"x96" Landis Hyd., Late
GEAR SHAPERS, Nos. 54SAS, 61A & 61 Fellows
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BORING MACHINERY
3¾" Bar No. 32 Lucas, horizontal, table type
3" Rockford horizontal, fixed table (2)
36" Rogers vert. T/L, side head, new 1942
36" Bullard vert. T/L, side head, #11325
72" Niles Bement Pond 2 heads, PRT, #17623
No. 46 Heald Borematic precision late type
No. DB216 Excello 6 spdl, D/E borer, late

DRILLS, RADIAL
3½ ft. arm 8" column American sensitive
4 ft. arm 13" column Carlton, MIB, late type
9 ft. arm 16" column American, late type.

GEAR HOBBERS
No. 12H Gould & Eberhardt universal
No. 36H Gould & Eberhardt universal
72" Schuchardt & Schutte universal

GEAR MACHINERY, MISC.
8" Red Ring shavers, with crowning (2) 1943
10" Pratt & Whitney hyd. gear grinder, 1944
12" Model 224 Illinois involute profile measuring machine, new 1943
13" Model Sheffield gear chamferer, 1947
No. 8 Barber Colman auto. hob sharpener, 1944
Nos. 71A, 75A, 712 and 715 Fellows HS shapers.

GRINDERS, CYLINDRICAL
4"x18" Cincinnati pl. hyd., plunge cut, 1946
10"x18" Norton types BA, A C, late models
10"x18" Cincinnati Ematic, type ER (2), 1941-1946
10"x36" Norton type C semi-auto., hyd. infeed
16"x36" Norton type C hydraulic (2), 1943
12"x36" Cincinnati universal, serial 10-3D-10-5
14"x36" Landis type C, hydraulic (2), 1946
16"x36" Norton type C, hydraulic (2), 1943
16"x60" Landis self-contained serial 11122
16"/26"x72" Norton type C, hydraulic, 1945
16"/40"x120" Landis gap type, hydraulic, serial 16185
16"/48"x96" Landis gap type hydraulic, new 1941

GRINDERS, SURFACE
16A2 Blanchard rotary surface, serial 6046, new 1946.
6"x18" Norton horizontal spindle, hydraulic, serial H365.
6"x18" Norton vert. spdl, hydraulic, 1942
8"x22" No. 3 Abrasive, motor in base (2), 1941
12"x36" Pratt & Whitney vert. spdl. ball bearing
12"x48" Model 300 Hanchett vert. spdl. 1946
72" No. 72 Hanchett ... ary surface, 1946

GRINDERS, MISC.
No. 2 Cincinnati cutter grinder, late model
30" Ingersoll cutter grinder, late model

INTERNAL GRINDERS:
Nos. 72, 72A3 and 72A5 Heald
No. 5 Bryant semi-automatic chucking
No. 2 Cincinnati centerless (5), 1942-1943
No. 49 Van Norman radius, 1945

LATHES, ENGINE
14"/28"x36" centers Smith-Drum, gap, 1945.
32"x12' bed Axelson toolroom, serial 2578, new 1945.
14"x42" Hendey G.H., M.D., 1946
18"x96" Cisco G.H., 12 speed, swings 29"
24"x14 ft. bed American G.H., Q.C.G., serial 44070
52"x30 ft. bed Niles Bement Pond G.H., like new

LATHES, MFG. & MISC. & TURRET
8"x21" Sundstrand Mfg. lathe, serial 88-1234, new 1947
14"x13 ft. bed Betts Bridgeford axle lathe
14"x18" Lips H. S. Carbo-lathe, 1943
17"x72" LeBlond Rapid production (5), 1946-1947
No. HS Libby International saddle type universal turret lathe, 1940
No. 5 Jones & Lamson Universal ram type turret lathes, (2) late models

MILLING MACHINES
1-12 Cincinnati production miller
No. 4-36 and 4-48 Cincinnati Hydromatic production
No. 2 Cincinnati high speed dial type plain
No. 2B and 5K Milwaukee universal
No. 3B and 3K Milwaukee universal
No. 3B and 4K Kearney & Trecker plain, late type
No. 22L Van Norman universal, 1945
12", 18", 24" Cincinnati plain manufacturing
No. 6 Becker heavy duty vertical
24"x24"x12 ft. Ingersoll adj. rail planer type mill, tracer controlled, 1945
30"x21"x12 ft. Ingersoll fixed rail planer type mill
42"x42"x18 ft. Ingersoll adj. rail double housing mill, 2 S.H. and 1 R.H. power on rail and head
42" Ingersoll 3 spindle rotary continuous mill
42" Ingersoll 2 spindle rotary continuous mill
48"x20"x20 ft. Ingersoll fixed rail double faced planer type mill
80"x48"x16 ft. Ingersoll adj. rail double housing planer type mill, 2 S.H. and 2 R.H.
72" swing 64" table Ingersoll 2 spindle rotary continuous mill, timken bearings.

PRESSES
106 Ton No. 93C Toledo SS, DC, air cushion.
800 Ton Cleveland Knuckle-joint coining, serial 8745, new 1947.
2 to 75 ton Ferracute punching (several)
3 to 60 ton O.B.I., most every make
100 ton No. 50-D-36 Cleveland DC, steel frame, 1940
500 ton No. 1042 Verson, steel frame, air clutch, late model

SHAPERS
16" American heavy pattern auto-oiled, F.M.D.
32" Gould & Eberhardt Invincible, F.M.D.
36" Rockford vert. hyd. slotter, 1942

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ACME GRIDLEY R8, 1⅝", 8-spindle; late type
CONOMATIC 1⅞", 8-spindle; M.D., late type
CLEVELAND 3¾" Model "A" Single spindle
CLEVELAND 6", Model "A", single spindle; late
NEW BRITAIN GRIDLEY Model 665; 6-spindle chucker; latest type; new 1943.

BORING MILLS—Horizontal
NILES 8" bar; floor type; motor drive
LANDIS No. 35 Floor Type Horiz. Boring Mill
HEALD No. 48A single end Boramatic; M.D.
HEALD No. 49 double end Boramatic; M.D.

BORING MILLS—Vertical
BULLARD 24", spiral drive, M.D., late type
BULLARD 54" Spiral drive, motor drive, late
CINCINNATI 96", 2 swivel hds., PRT; M.D.
NILES 53", 2 swivel heads, PRT; M.D.
NILES 100" 2 swivel heads, PRT; M.D.
SELLERS 144", 2 swivel heads on cross rail; PRT

BROACHES
CINCINNATI 1-30 Duplex Vertical cap. 2,000 lbs. 30" stroke; Hydraulic; late.
COLONIAL VGI-10-48 Vertical; Hydraulic; late
LAPOINTE 10-54" Vertical, Model SRV; new 1947
OILGEAR type XL-6 single ram; late type.

DRILLS
AMERICAN 4' arm 11" col. "Hole Wizard", late
AMERICAN 5' arm 11" col. "Hole Wizard", late
AMERICAN 5' arm 13" col. "Hole Wizard", late
BARNES #20I-¼, 4 spindle, M.D., late type
BARNES H-2 Hydram, 2" capacity; M.D., late type
NATCO B3B Hole Steel, 12 adj. spindles; late type
NATCO Model B4B arranged for 60 spindles, late
NATCO Model E5 arranged for 12 spindles; late

FELLOWS GEAR EQUIPMENT
FELLOWS No. 6 High Speed Gear Shaper; late
FELLOWS No. 7A High Speed Gear Shaper; late
FELLOWS No. 4B High Speed Gear Shaper; internal cap. 72" diameter; late
FELLOWS No. 6IA High Speed Gear Shaper; late
FELLOWS No. 6Z2 High Speed Gear Shaper; late
FELLOWS No. 7S High Speed Gear Shaper; late
FELLOWS No. 13LS Lapper; motor drive, late

GLEASON GEAR EQUIPMENT
GLEASON 3" Spiral Gear Generator; late
GLEASON No. 4 Tester; late type
GLEASON 11" Straight Bevel Gear Gen.; M.D.
GLEASON No. 7 Hyp. Cutter Sharp; latest type
GLEASON No. 12 Tool Sharpener; motor drive
GLEASON No. 13 Hyp. Cutter Sharpener; late
GLEASON 12" Spiral Bev. Cutter Sharpener; M.D.
GLEASON 12" Straight Bevel Generator; late
GLEASON No. 14 Spiral Bevel Hyp. Gear Grinder
GLEASON No. 15 Quenching Press; late type
GLEASON No. 17 Spiral Bevel, Zerol and Hypoid Gear Grinder, M.D., late
GLEASON 18" Straight Bevel Gear Gen.; M.D.
GLEASON No. 18 Gear Tester and Lapper; M.D.
GLEASON No. 20 Spur Gear Toster; latest type
GLEASON 24" Bevel Gear Planer; motor drive
GLEASON 25" Straight Bevel Gear Gen.; M.D.
GLEASON 27" Bevel Gear Planer; M.D.
GLEASON 25" Spiral Bevel Gear Gen.; M.D.
GLEASON No. 6 Revacycle 5" cone distance; late

GRINDERS, Cyl. Plain & Univ.
BROWN & SHARPE #13 Universal Tool and Grinder; late type
BROWN & SHARPE #3 Universal; M.D., late type
CINCINNATI 14"x72" Universal; M.D., late type
CINCINNATI 9"x18" Plain, "Filmatic"; late type
LANDIS 10"x18" type CC Plain, Hydraulic, late
NORTON 4"x12" Model CTU Plain, year 1952
NORTON 6"x18" Type "C" Plain; late type

GRINDERS, Internal
BRYANT #5, #16-C-16 Hydraulic; late type
BRYANT #24-36" Hydraulic; late type
HEALD #70A Int. M.D., late type
HEALD #3I Plain chuck type; New 1947
HEALD #72A5 Plain & "Gagematic"; late type

GRINDERS, Surface
ABRASIVE #34, 8"x24" table; late type
HEALD #22 Rotary, 12" chuck; M.D., late

LATHES, Turret
BARDONS & OLIVER #5 Univ. Ram Type; late
GISHOLT #1L and #2L Saddle type; Timken; late
GISHOLT #3 Universal ram type; M.D., late
MOREY #2, #3, #4 ram type; Timken; latest type
WARNER & SWASEY #1-A Universal; Hex., late
WARNER & SWASEY #2 All Geared Head; late
WARNER & SWASEY #3 and #5 Univ. ram type

LATHES, Engine & Mfg.
HENDEY 24"x36" centers; M.D., late type
LeBLOND 20"x48" centers; Timken; late type
LeBLOND 36"x204" Heavy Duty; PRT; Timken; late
LODGE & SHIPLEY 12"x30" G.H. Toolroom Lathe
LODGE & SHIPLEY 14"x30" centers; late type
MONARCH Model EE 10"x20" Engine Lathe; late
MONARCH 12"x30" centers; Model CKK; late type
NILES 30"x50' bed, single end boring, "Time Saver"
PRATT & WHITNEY 18"x30" centers; Timken
REED PRENTICE 14"x54" centers; Timken; late
SUNDSTRAND 60" centers; auto Type B; late

MILLING MACHINES, Plain
BROWN & SHARPE #2 Plain Miller; late type
CINCINNATI 1-18 Production; Timken; late type
KEARNEY & TRECKER 2H Plain; Timken; PRT;
KEARNEY & TRECKER Model 2HL; M.D., late
KEARNEY & TRECKER 4H Plain, Timken; late

MILLING MACHINES Thread
HALL Style "D" Planetary; late type
LEES BRADNER Model #LT 6"x36" #HT 12"x24" and 12"x36" centers; late type
MOREY 12"x30" and 12"x160" centers; late type

MILLING MACHINES, Universal
BROWN & SHARPE #2 Universal Miller; late type
CINCINNATI 2MH Univ., motor drive, late type
CINCINNATI #3 Dial Type, Timken, M.D., late
KEARNEY & TRECKER #3K; Timken; late type
VAN NORMAN #22L, #26 and #36 ram type; late

MILLING MACHINES, Vertical
CINCINNATI #4 H.S. Dial type; late
CINCINNATI 0-8 Vertical; Timken; late type
CINCINNATI #3 Dial Type; High Speed, New 1953
KEARNEY & TRECKER #3H and #4H H.S. late

PLANERS
DETRICK & HARVEY 48"x48"x16'; 4 hds; hydr.
GRAY 36"x36"x10' "Maximum Service" 4 hds; PRT; DC; Reversing
GRAY 48"x48"x10' "Maximum Service" 4 hds; PRT; DC; Reversing
LIBERTY 144"x76"x48' adj. openside; box table; 4 hds; vari-voltage; PRT; New 1940
NILES-BEMENT-POND 72"x72"M30'; 4 hds; PRT; DC; M.D.

PRESSES
BLISS #410A, 525-ton double action toggle drawing press, with or without cushions; M.D.
NATIONAL #5 "Maxi-Press", 1000-ton cap. H.S. Forging Machine; M.D.
SHAW 250-ton Hydraulic flanging press; late
WATERBURY FARREL #9, 125-ton cap., M.D.

MISCELLANEOUS
ALEXANDER #2, 3-dim. Engraving' NEW 1952
BAKER No. 5 Keyseater; motor drive
BARNES No. 172, 214 Honing; M.D., hydr.; late
FISCHER No. 1 Oil Groover; M.D.; late
HILLES & JONES #7 Plate Bending Roll; M.D.
LANDIS 2" Double Spindle, Threaders
LeBLOND No. 2 Deep Hole Reaming, late type
LeBLOND No. 2 Deep Hole Rifling, late type
MANVILLE No. 3 Roll Head Trimmer, M.D.
MANVILLE 2C Screw Slotter, Motor Drive
MANVILLE No. 1 Screw Slotter, Motor Drive
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VAN NORMAN No. 639 Oscillating Radius Grinder

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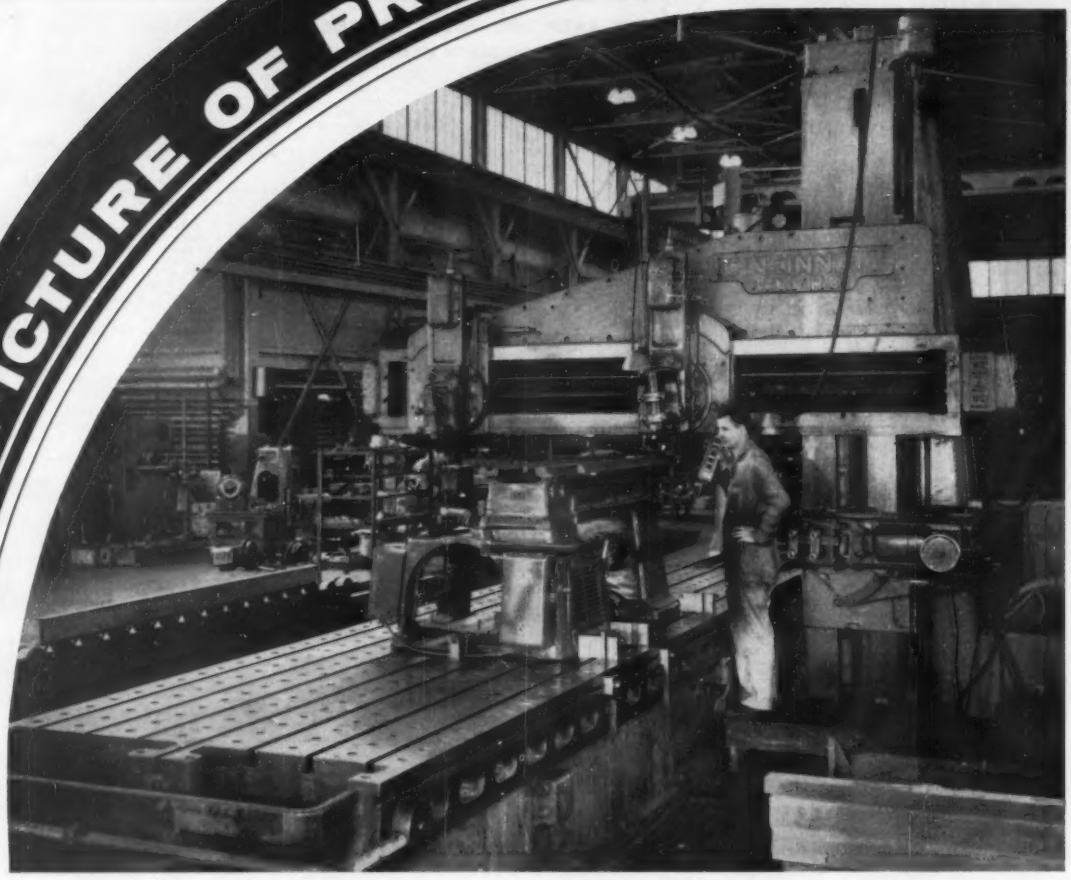

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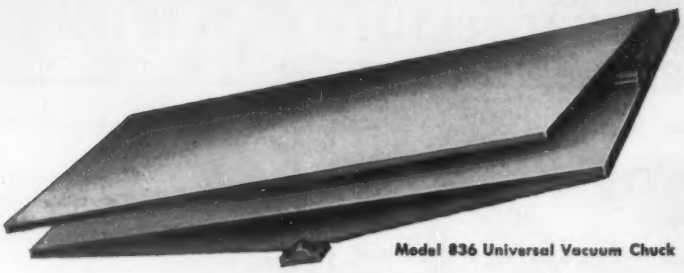

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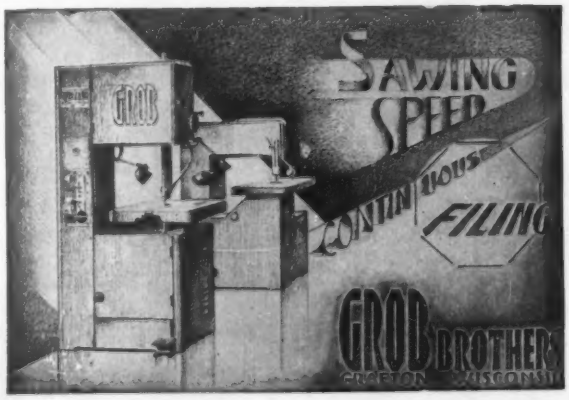

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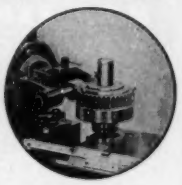

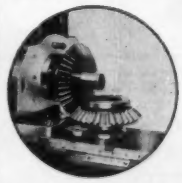

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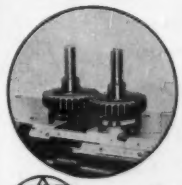

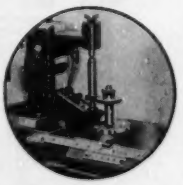

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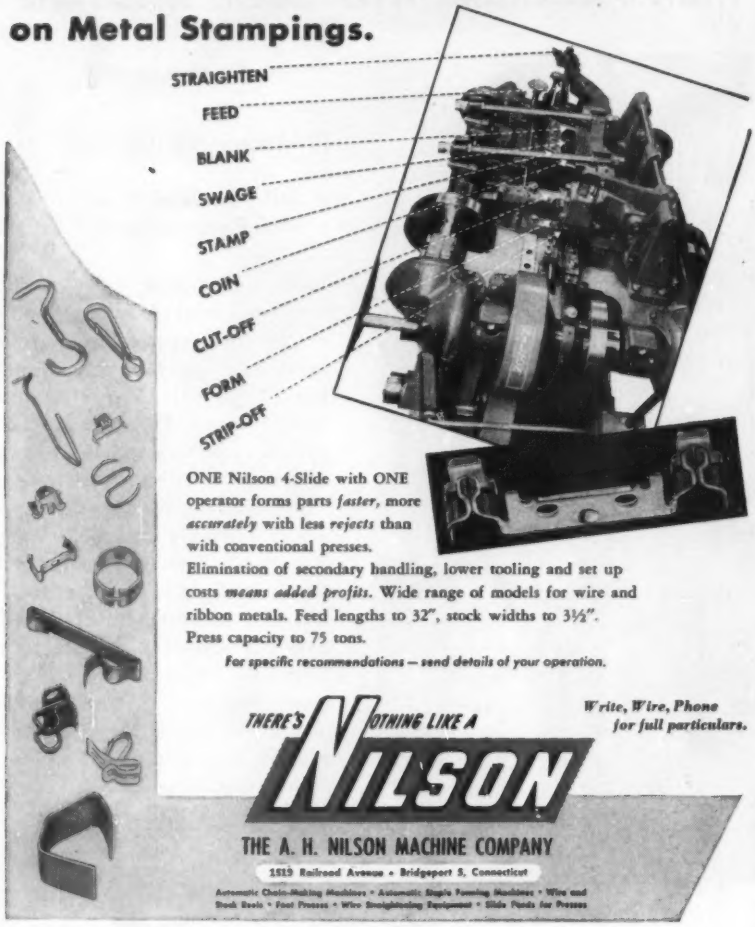

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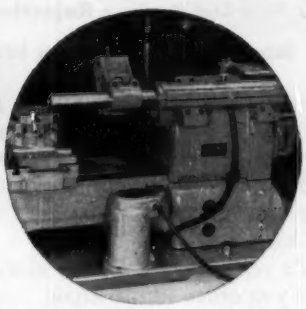

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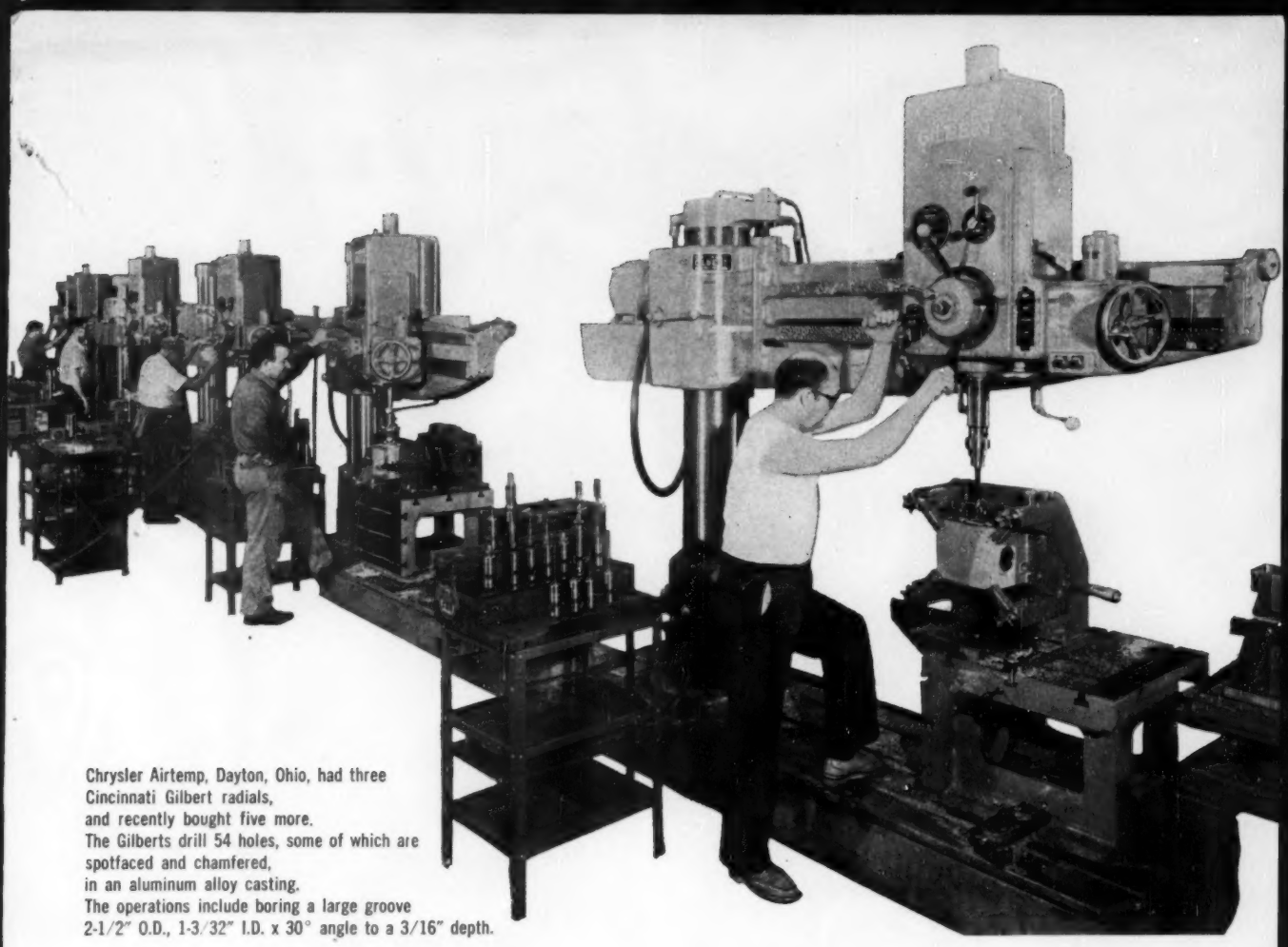


Chrysler Airtemp, Dayton, Ohio, had three Cincinnati Gilbert radials, and recently bought five more. The Gilberts drill 54 holes, some of which are spotfaced and chamfered, in an aluminum alloy casting. The operations include boring a large groove 2-1/2" O.D., 1-3/32" I.D. x 30° angle to a 3/16" depth.

They bought five more...

because Gilberts produce more. Ease of operation explains in part why Gilbert radials produce more in so many plants. For example, all speed and feed controls are on the head, within easy reach of the operator even when the arm is in its highest position. Direct reading speed and feed plates eliminate time-consuming calculations. You get instant finger-tip shifting of speed and feed levers. The four-lever feed turnstile puts one lever always within handy reach. Other easy-operating features: finger-tip clamping of the head to the arm; instantaneous one-lever arm control (unclamps, raises, or lowers the arm in one easy motion); effortless head traversing due to balanced, ball-bearing mounting; adjustable electric light at the spindle.

Gilbert radials have 9 or 11-inch columns; 12 spindle speeds in each of 3 ranges; 6 power feeds, .003" to .020". Tap leads are available. *Delivery in 30 days or less.* As the Chrysler Airtemp story shows, "those who buy Gilbert buy Gilbert again." Get full data on the Gilbert's many advantages.

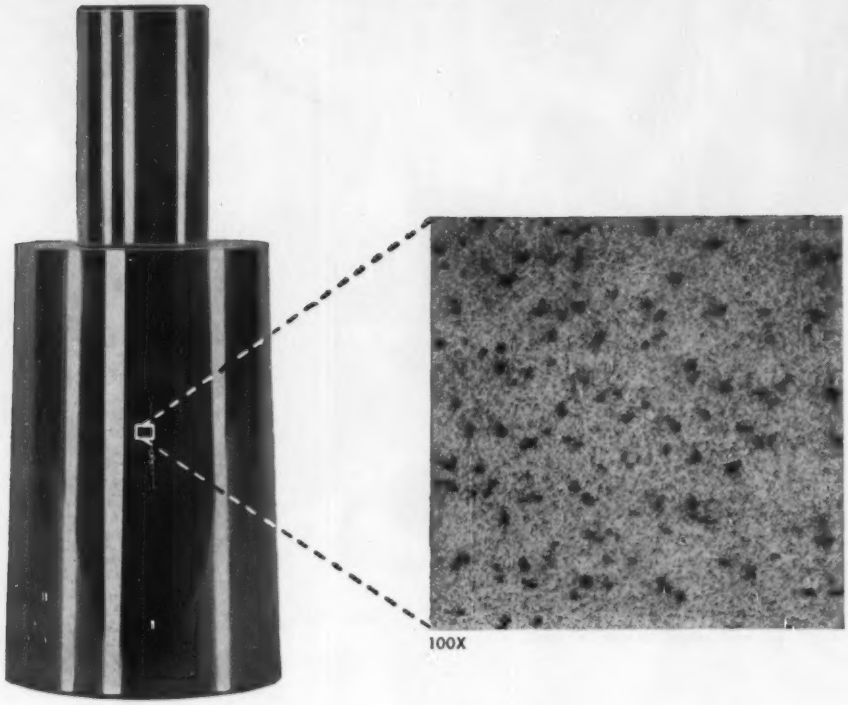
Write for Bulletin 349 today. ▼

GILBERT

RADIALS • BORING MILLS • ACCESSORIES

THE CINCINNATI GILBERT MACHINE TOOL CO., 3366 BEEKMAN ST. • CINCINNATI 23, OHIO

You can <u>see</u> why Graph-Mo® outwears other gage steels 3 to 1!



GRAPH-MO® steel is a *different kind* of gage steel. And the difference between Graph-Mo and ordinary gage steels is so real you can *see* it!

A piece of polished Graph-Mo steel has a "graphitic look"—tiny, scattered, parallel marks barely visible on the surface. These marks are the result of free graphite in the steel's structure. And this free graphite, together with diamond-hard carbides, enables Graph-Mo to outwear other gage steels an average of 3 to 1. Reports from dozens of gage users who've switched to Graph-Mo prove it! (Details on request.)

The photomicrograph (above) shows the free graphite and diamond-hard carbides that give Graph-Mo its unusual wear resistance. They also minimize scuffing, pick up and galling, and resist abrasion.

Tests prove that Graph-Mo is the most stable gage steel ever made, too! After a 12-year period, a typical Graph-Mo steel master plug gage showed less than 10 millionths of an inch change from its original measurement.

And constant-pressure machinability tests show Graph-Mo machines 30% faster than other gage steels. (Machinability test data on request.)

You can always tell Graph-Mo by its "graphitic look". This built-in "trade-mark", the result of the free graphite in its structure, can't be duplicated in other steels. Look for it, insist upon it, next time you buy gages. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING